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OF

ARTS, MANUFACTURES,

AND

AGRICULTURE.

NUMBER XX. SECOND SERIES. Jan. 1, 1804.

Specification of the Patent granted to JOSEPH HUDDART, *of Islington, in the County of Middlesex, Gentleman; for a new Mode or Art of making great Cables, and other Cordage, so as to attain a greater Degree of Strength therein, by a more equal Distribution of the Strain upon the Yarns.* Dated April 25, 1803.

With a Plate.

TO all to whom these presents shall come, &c. NOW KNOW YE, that I the said Joseph Huddart, in compliance with the said proviso, do hereby describe and ascertain the nature of my said invention, and declare that the plan thereof hereto annexed (see Plate IV.) is composed of the following particulars; that is to say: No. I, a spindle and bobbin, in which A B represents the spindle; C D, the bobbin (with the yarn upon it from *c* to D); E F, the axis which carries the spindle; *a* G H an arm of wood, fixed upon the square part of the spindle, and which goes round with it (part of which G H may be of wire) with a hole

hole at H, or a friction wheel or pully to receive the rope-yarn, which from thence is to be led through a hole in the end of the spindle at B. At K a spring is fixed to the wooden arm by means of a screw and nails, or otherwise. The screw works in the square part of the spindle by means of which the spring may be made stronger or weaker as requisite, the other end of which resting upon the globular part of the head of the bobbin formed for that purpose, to regulate the tension of the yarn in drawing it from the bobbin, whilst the spindle is turning in registering the strand. This spindle and bobbin is carried by the axis E F. The smaller end of the spiddle A is square or triangular, and fits into the end of the axis at E; which axis is carried by a band going round the pully (or pinion if carried by a wheel with teeth) at *e f*. The spindle and bobbin is easily shifted by lifting the end at B out of the notch which it runs in, and drawing it out of the axis at E.

No. II, another spindle and bobbin, in which I, L, M, N, O, K, represents a spindle, continued into a square frame of iron, to revolve round upon the pivots I, K. The pivot at I is perforated, in order to receive the rope-yarn from the bobbin, which runs at a right angle to I K upon the spindle or axis P Q. This bobbin is adjusted by a screw in the same manner as the first-mentioned, or by two springs and screws *x* and *y*, one at the head P and the other at Q, having two globular, or nearly parallel, parts at each end of the bobbin for that purpose. The bobbin is soon shifted by taking out the spindle P Q, which is done by shoving it towards P against the spring *p* P, till the end of Q in the square frame is relieved; the spring *p* P is to keep the spindle in its place, while the whole is carried round upon the pivots I, K, by tooth and pinion, or band, round the pully R S, and at the same time supplies the

the yarn as before mentioned, whilst the strand is registering.

Nos. III, the machine which carries the spindles in horizontal ranges, and ought to be constructed according to the size of the largest ropes the manufacturer has occasion to make. Fig. 1, represents an elevation or section, whose plane is perpendicular to the axis and spindles; and the circles projected thereon are the large end of the bobbins, which are placed in horizontal ranges, each range supported upon the horizontal railing, and rise higher from the front towards the back part of the machine.—No. III, Fig. 2, represents a profile or section parallel to the axis of the spindles, and perpendicular to the horizon.—No. III, Fig. 3, the horizontal plane, which is also parallel to the axis of the spindles. In these three figures the same letters are used in each, to denote the same part of the machinery: the number of spindles to be employed in this machinery may be increased or diminished, as occasion may require. The base of this machine consists of three pieces of timber to lay upon the ground or near it, marked A in Fig. 1, and A *a* in Figs. 2 and 3; and at right angles to these are bolted two pieces B *b* over the ends of the former, and a third may be added endwise between if necessary, to secure the whole, and must extend over the piece A *a* on one side a convenient length, to receive the pillars, which support the long axis Fig. 3; which long axis, when turned by the handle G, gives motion to all the spindles by the communication of a band to every range of spindles. In this machine there is allowed one foot of room for diameter of the bobbin, and eighteen inches for the length of the spindle marked *y*: the spindles are carried by an axis marked *x*, (as represented in spindle and bobbin, No. I,) and will therefore require three rails

 or

or ranges of boards for each range of spindles, two of which support the pivots of the axis *x*, and are marked D *d*, No. III, Fig. 1, and the third, the front end of the spindle, in which there is a notch to drop the spindle into when the bobbin is shifted. Those are supported by the pillars E, *e*, No. III, Fig. 2. Each range is fixed higher than the one before it; and it is also necessary to have a rail F for each range, to lead the yarns clear of the foremost bobbins, which rail has a notch cut in it for each yarn to lead through.—Upon the long axis, which is carried by the handle G, are as many pullies as there are ranges of spindles. In this drawing they are seven in number, and are marked K; the band going round these pullies passes over the friction wheel H, and thence round every pully in that particular range, and over the friction wheel *h*, and returns again into itself at the pully K, which, with the pullies upon that range, must be equal in diameter, in order that one turn of the handle may give one turn to each spindle; and the same must be attended to in every range. The machinery for the spindle and bobbin No. II, differs from that of No. I, in this respect only, that it is necessary to allow more room in the breadth for each bobbin, and consequently there will be fewer bobbins in each range when the breadth of the machine is the same. The machine will require but two rails to support the spindles, as they require no separate axis to carry them, the pully being fast to the spindle, and always remaining in the machine, for the small iron rod only (which the bobbin runs upon) is taken out to shift the bobbin. In these machines there is a space left between the first and second, the third and fifth, and the sixth and seventh ranges of spindles, as marked M, in No. III, Figs. 2 and 3, to allow a person to pass between, and shift or replace any

particular

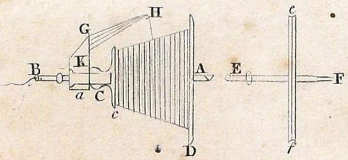
particular bobbin that may have the yarn expended. And it is also to be observed, that those machines may have the spindles carried by wheels and pinions, instead of bands and pullies, if required. I have represented in No III, Fig. 2, the yarn from each of the seven ranges of spindles passing over the rail F, and from thence to the posts marked L, in which there are as many rails as ranges of spindles. There are cleats upon each post to support the rails, and each rail has as many notches in the upper side as there are spindles in a range. I have represented one of those rails, No. III, Fig. 3, and the yarns leading from the front range of spindles. This railing may be either in the middle of the ground or carried along one side, as in No. III, Fig. 3; the distances between them such as may be thought necessary for supporting the yarns, and keeping them separate the whole length of the strand, and may be made of various constructions.

No. VII. rails (*a*), which will be intelligible upon inspection of the drawing, where B *b* represents the rails.

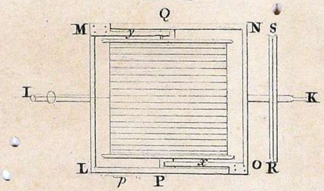
The register is calculated to form the strand into shells of yarns, and therefore they must be made of different sizes, and with more or fewer holes, according to the intended size of the cable or rope. In the drawing No. IV, the front, A *a*, B *b*, made of wood, is perforated with circular ranges of holes, which may be about two inches asunder, through which all the yarns in the strand are to pass, and this brings them into a proper form to go through a smaller and similar plate D *d*, having in it as many holes, as A *a*, B *b*. This plate may be made of wood or metal, the plane of the front of which must be parallel to A *a*, B *b*, and fastened to it by three or four bars of wood or iron; the holes in D *d* must be so near together at the side next F as only just to free them

clear

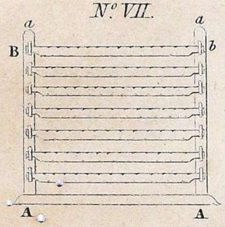
N.° I.



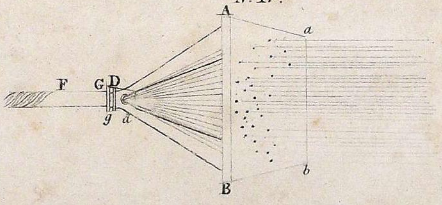
N.° II.



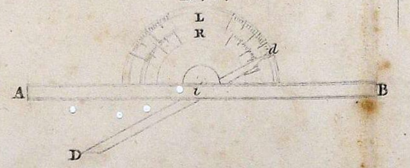
N.° VII.



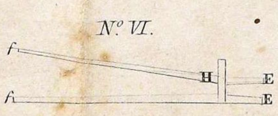
N.° IV.



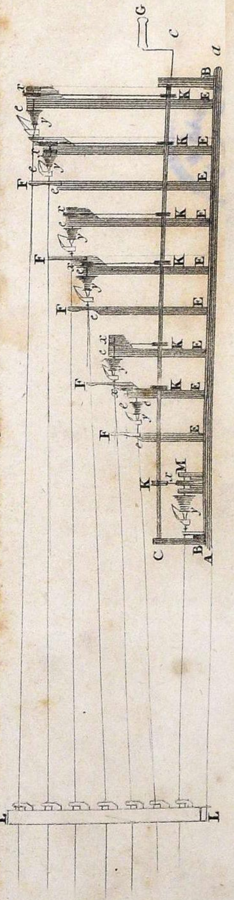
N.° V.



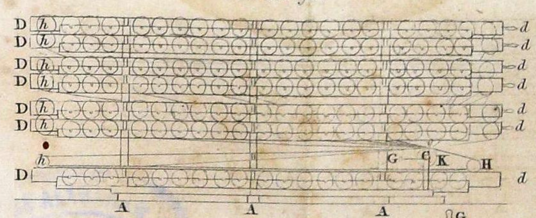
N.° VI.

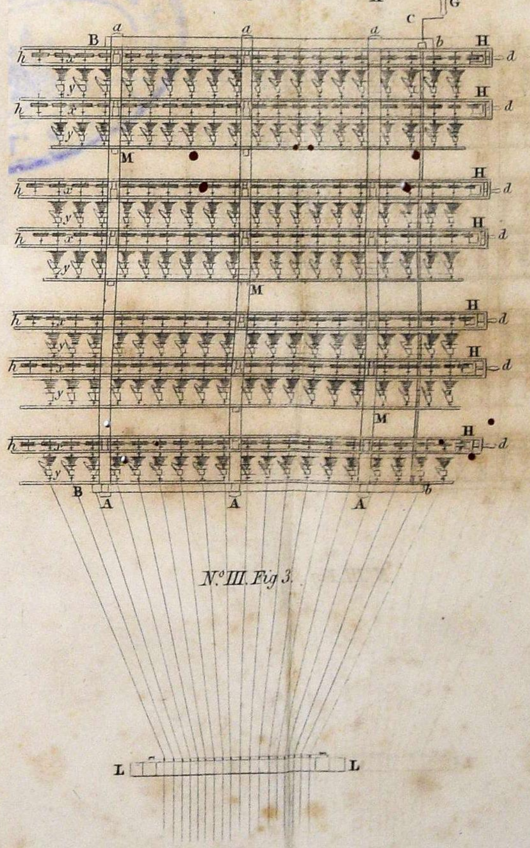


N.° III. Fig. 2.



N.° III. Fig. 1.





N.° III. Fig. 3.

tance for the man who registers to lay hold of, and by this heaver compressing the tube by a constant force, the tube will expand or contract, in case the general run of the yarns be thicker or smaller in different parts of the strand, and will form, as was said before, a compact strand, and free from hollows, which might otherwise be occasioned by crossing of yarns over each other.

No. V. *Register Gauge* is as follows. A B, is the stock or thick part of the gauge, in which there is a groove or slit for the tongue or index D *d* to move in; upon the centre *i*, on the side *d*, is fixed to the stock A B a semicircle, upon which are two graduated arcs of circles concentric with *i*, one of which is marked L, *(laying,)* the other R, *(registering)*; those two arcs are graduated, answering to the mean stretching of the yarns founded upon experiments. To use it, the stock of the gauge must be applied to the side of the strand parallel to the axis, and the tongue to lay over parallel to that part of the shell of outside yarns where it touches the strand, which shews the angle made by the outside shell of yarns; and a line on the surface parallel to the centre of the strand, and the corresponding graduation must be used in registering, and when the strands are laid into a rope.

Having described the various parts of the machinery and implements to be used, I shall now enter upon the operation. The bobbins being all wound full of yarn, (which may be done by a machine to fix them upon with a handle to it,) and put upon the spindles, and the ends of the yarns led through the holes H, and ends of the spindle B, No. I. The end of the spindle A, is put into the end E of the axis, (which always remains ready for use,) and the fore end of the spindle B dropped into the notch in the rail; then draw off some yarn, and regulate the

the springs, if wanted, till of equal force, and sufficiently tight.—Then draw off the yarns, leaving the yarn from the bobbin long enough to reach the fore part of the machine where it is to be knotted to the yarns of the strand having fixed as many bobbins as intended yarns in the strand, or in the three strands, if the machine will carry so many, for though I shall only speak of registering one strand, yet the three strands may be registered all at the same time; the bands (if bands are used and not wheel-work) should also be made tight to carry the axis, which is done by a screw, *d*, adjusting the friction-wheel H. The strand is then to be run and laid upon the rails or supporters, each yarn in its proper notch, and for expedition, one of the rails may be used for separating the yarns, and laying them in the rails, dropping a whole range into the notches at once, which being done, the yarns of the strand are to be smooth knotted to the respective yarns from the bobbins, and the machine is ready for use. The yarns at the other end of the strand are then to be put through the register, taking off the tube and plate, if not already done; it is best to take the centre yarn from the railing, (or middle yarn of the middle rail,) which put through the centre hole of the register, and then select the yarns from the railing, to lead clear of each other when stretched to the holes in the register. The holes in the register being completed with yarns, let the ends be collected together upon a stretch, and made fast to the hook which turns the strand in registering, and slide the register back near to the hook, if not so before; then put on the tube and plate, and adjust it by the screws when upon the strand. Lastly, put round the tube the thong or wire, and make it fast to the jaws of the heaver, and heave it tight. If the handles of the heaver are too near or too far from each other,

for

for the convenience of the man that registers the strand, alter the bolt till it is right, and all is ready to begin to register the strand. The foreman having determined how hard he will lay the rope, suppose No. 10, in the register gauge, fix index *d* of the gauge to 10 on the arc R, and taking a few turns with the hook, keeping the heaver tight to compress the tube, try the gauge, and regulate the registering according as it is found to vary, till the outside yarns correspond with the tongue D of the gauge, and make the required angle, and which may be repeated as often as it is thought necessary through the registering of the strand. If the three strands are registering together, it must be a triple register in one frame, and there is no necessity to try but one strand with the gauge, if the yarns are of the same kind. The three strands (or four, if a four strand rope) being registered, must be made fast to the hooks in the common way equally tight. For laying, the index of the gauge being altered from 10 on the arc R to 10 on the arc L, or whatever the number was intended to be, the corresponding numbers must be used, then turning the hooks of the strands till the outside shell of yarns correspond with the tongue of the gauge, and begin to lay the rope. It is to be understood, that in registering, a sufficient weight is laid upon the hook to prevent its being drawn towards the machine.

In witness whereof, &c.

Specification of the Patent granted to DANIEL PAULIN DAVIS, *of Bloomsbury-square, in the Parish of Saint George, Bloomsbury, in the County of Middlesex, Surveyor; for an improved Machine for, and Method of, cleansing and sweeping Chimneys, and extinguishing them when on Fire, which will supersede the Necessity of their being explored by Children as now practised.*

Dated April 11, 1803.

TO all to whom these presents shall come, &c. NOW KNOW YE, that in compliance with the said proviso, I the said Daniel Paulin Davis do hereby declare, that my said invention of machines or apparatus for cleansing chimneys, and extinguishing them when on fire, hoping thereby to supersede the necessity of that business being performed by children as is at present generally practised; the particulars and explanation to the respective parts, collectively as well as individually, of each and every part of the said machine or machines, or apparatus, are as follows: A swinging or fixed bar or roller, as the case may require, is to be fixed at the top, or thereabouts, of the funnel or flue of the chimney, in an horizontal direction, from side to side, over which a chain or rope, formed of metal, or other materials proper for the purpose, is to be suspended, and sufficiently long to reach below the mouth or mouths of each chimney, where an expanding or flexible brush or brushes, composed of hair, cane, willow, birch, or other proper materials, is to be hooked, or otherwise fastened to the said chain, wire, or rope, as occasion may require, or when wanting for use, and taking off when the flue or chimney is sufficiently swept or cleansed. And in order to do that the more effectually, a roller or bar is to be fixed from

the inside of the breast to the back, at a sufficient distance from the jamb on each side the mouth or throat of the chimney. A few inches above the chimney-bar, or mantle, over which the chain, wire, or rope, or projecting wings of the flues will not escape being swept, as well in the channel of the flues as the mouth or throat of the same, some of which run in a zigzag or crooked direction, so as to leave the points of the gathering wings with a sharp edge; and therefore to prevent the brush or brushes, chain, wire, or rope, from meeting with any effective impediment in its passage from the mouth or throat of the chimney to the top of the channel of the said flues in passing up or down, some small balls of cork will be hung on various parts of the said chain, wire, or rope, to become moveable whenever it meets with the smallest interruption in its passage, as before described. And, to prevent the necessity of any person or persons going withinside the mouth of the chimney, for the purpose of drawing up or down the brush or brushes before named, as well as to keep the soot withinside when falling by being so disturbed, I have formed an apron or cloth to be hung against the opening of the chimney, with two arm-holes therein, through which the hands or the arms of the person so employed are to be placed; by which the brush and chain, wire, or rope, can be drawn up and down without being exposed to the soot when falling or receiving it into the room or works. And after the business is so performed, either the same chain, wire, or cord, may be left in the chimney, across the bar, or some other hauled by the end into its place, and the ends thereof fastened within reach of the hand. And in case a flue or chimney should be on fire, wherein the aforesaid machine or apparatus is contained, I have formed a bag or parcel of wadding, which by being

wetted and hung on the chain or rope in lieu of the brush, to be drawn up and down the flue or channel in the same way as is recommended for cleansing the same. The brush or broom above alluded to may be made in a variety of forms, suitable to the size, shape, or direction of the flues intended to be therewith cleansed. That best calculated for general use is made of balls of wood, or other materials, closely connected to each other by links, yielding to every direction, and adapted to receive, and securely hold, stiff horse-hair, bristles, slender twigs of willow, cane, or strips of whalebone; which brush or broom may easily be drawn over the aforesaid roller, and is indispensibly necessary for cleansing the tops of hovelled and hooded chimneys. In other cases, where it is not requisite to carry it over such roller, another kind of brush or broom, of like materials, may be used, made of four or more moveable sides, supported by, and moving upon, transverse props; which sides may be drawn together at either end by means of lines fixed at the top and bottom of each moveable side, and passing through a ring at each end of the bar, whereon the props are fastened. The sides should be about the same length as the stem or bar to which the drops are fixed; and the props may be set either at the centre of the stem, or nearer to one end, according to the expansion required. I propose also, that the props themselves be made to slide across the bar similar to the slide of a gauge, and to be fastened in any position by a setting screw pressing against their side; and the length of the whole is to be governed by the dimensions of the flue or chimney intended to be swept.

In witness whereof, &c.

Specification

Specification of the Patent granted to THOMAS KENTISH, *of Baker-street North, Portman-square, in the County of Middlesex, Gentleman; for an improved Derrick, for the Purpose of more expeditiously, with less Labour and at less Expense than heretofore, loading and unloading Ships and Vessels, and removing heavy Bodies in any Direction; and which is also applicable to other useful Purposes.* Dated July 29, 1803.

With a Plate.

'TO all to whom these presents shall come, &c. NOW KNOW YE, that in compliance with the said proviso, I the said Thomas Kentish do hereby describe and ascertain the nature of my said invention, and the manner in which the same is to be performed, by the drawings in the margin of these presents, and as follows; that is to say:

In Fig. 1, (Plate V.) A represents the derrick; B, the purchase wheel; C, the axletree; D, four plates of iron to support the wheel; E, an iron cap for the two plates of D, to fasten with an iron bolt; G, a roller to take the rope of the wheel B; H, the handles; I, four plates of iron to support the roller; K, a break-wheel; L, a lever to press on the wheel K, to lower the weight down. M, a ratched-wheel and paul to stop the roller from going back when hoisting up the weight; O, a ship's mast or a post in the ground on shore, to keep the derrick with a guy; P, the guy; R, a shieve to keep the rope extended; S, a hook to draw the weight; T, the step for the derrick; V, two thwart guys; U, a lever to direct the purchase wheel B and axletree C to keep its level.

To

To fix the derrick for use on board a ship or other vessel, the step should be secured so near the gunwhale as to allow room for the handles to work, and the head should be secured to the main-yard when stopped up to plumb the step, or to the head of the main-mast, as occasion may require. To fix the derrick for use on shore, a strong oak post of about fifteen inches diameter, more or less, according to the weight to be raised, should be well secured about six feet in the earth with spur-shores. By the derrick thus constructed and fixed, a considerable deal of labour will be saved, and the removal of heavy bodies in any direction very much facilitated.

Fig. 2, the roller, detached, for the purpose of shewing its form and construction, it being different from the roller hitherto used for that purpose.

In witness whereof, &c.

Observations by the Patentee.

The derrick described above has been tried on board a West India ship, and approved. I have now one nearly finished, calculated to hoist up a hogshead of sugar from a ship's hold, twenty-three feet deep, which may be done by three men, equal to eight men, now required at the capstan on-board ship, to deliver a cargo of sugar.

During forty-five years experience in the sea-service, part in his Majesty's navy, and part in the merchant-service, no improvement has been made in the method of loading and unloading ships. I have by study, perseverance, and expense, improved a derrick, which I hope will benefit the public.

By the cranes, both of the old and new invention, there is no difficulty in raising a weight; but I have frequently

quently seen accidents in lowering the lever (when left to unskilful hands) on the break-wheel: the weight has gained so great a velocity, that it could not be checked in time to prevent mischief. The common method of delivering a cargo from ships is by a large luff tackle, fixed to the head of the derrick, the end of the face brought to the capstan, by which four men can with difficulty raise a hogshead of sugar, but it requires five to lower it down with safety; the weight frequently overpowered that number, and obliged them to drop from the bars.

To prevent such accidents, I invented the roller with two inclined planes to my derrick; three turns or more with great weight of rope, from the purchase wheel at the head, are to turn round the centre of the roller, which is taken off as the weight ascends, by a small roller, with two inclined planes, placed a little above the large roller, a man holding or drawing the rope off until the weight is as high as wanted, then the lever is pressed on the break-wheel by a weight at the end, sufficient to check the roller, and make it perfectly easy to the man or boy to ease the rope away as fast or as slow as he pleases. The weight being checked by three powers, the boy holding on the rope, the handle to the roller, and the lever pressing on the brake-wheel.

To place the derrick on board ship, the step must be placed in the centre, on the side of the deck, between the centre of the hatchway and the centre of the craft alongside, the main-yard toped up and secured by about two turns of the topsail-sheet round the main-mast head and main-yard, so that the guy-block for the guy to lead to, and support the head of the derrick, may exactly plumb the step of the derrick on the deck, by which means the weight

weight may either be drawn out of the ship's hold, or out of the craft, without hoisting or lowering the head of the derrick, as the head will plumb both places as required.

The derrick may be applied to various uses on shore, on board his Majesty's ships in ordinary, hospital and prison ships, or to get in the guns and stores of a man of war, by a few hands, before the proper officers and ship's company are ordered on board. The wheel and roller to hoist up water from a deep well, and bring up a large quantity, with less strength and labour than is now required by the common wheel and pinion, hoisting up boats on board men of war or merchant ships to the stern and quarters with more ease and expedition than by the common tackle now used, and lowering them down with safety, as she must go down horizontal into the water, and is disengaged in a moment, which prevents accidents, particularly when the ship has stern way, the boat is often in danger under the counter, before the tackle can be unhooked. Four men will be sufficient to deliver a sugar ship, it now requires eight with the capstan. The derrick gains time, as it will raise a ton weight twenty feet in two minutes, which is very considerably less time than now taken by the capstan. There is likewise a saving in rope; the whole used only weighs three quarters of a hundred, and when condemned for the use of the derrick it will make better lanyards for the top-mast rigging than new rope. The machine with care will last as long as the ship, as it is not liable to get out of repair, and should any accident happen to it, any common mechanic can repair.

Fig. 1.

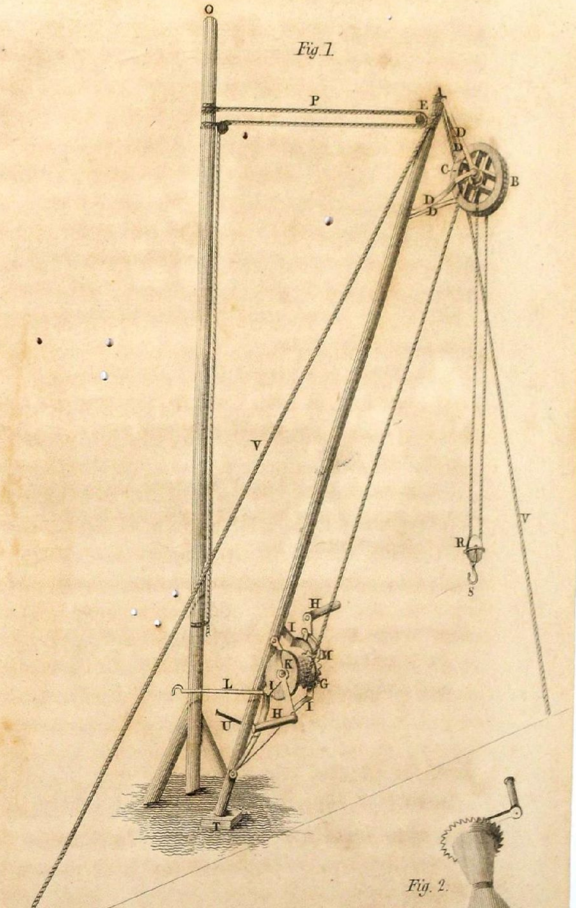
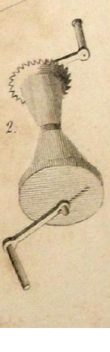


Fig. 2.



Specification of the Patent granted to Robert Ransome, *of Ipswich, in the County of Suffolk, Iron-founder, being one of the People called Quakers; for a Method of making and tempering Cast-Iron Plough-Shares, and other Articles of Cast-Iron for Agricultural Uses.*

Dated September 24, 1803.

TO all to whom these presents shall come, &c. Now know ye, that in compliance with the said proviso, I the said Robert Ransome do hereby declare that my said invention of a method of making and tempering cast-iron plough-shares, and other articles of cast-iron for agricultural uses, is as follows:

First for the shares.—The melted pig-iron is poured into a mould, prepared for the purpose, formed with one side or part of iron, and the other side or part of sand or loam. The side of the share when cast that lays next the iron-mould will be hard, and of proper temper, while the other side that is formed in sand or loam will be soft; and if made of the best soft pig-iron, the share will be much strengthened.

To make the moulds for casting the said plough-shares I proceed as follows: First, take a well-finished pattern of a plough-share, made either of iron or other metal; then lay it upon sand or loam, carefully stopping it up until an accurate parting is made of that side of the share which is designed to be hardened; then pour thereon either lead, plaster of Paris, or other proper materials, that will take an exact impression there-from. With this cast of lead, plaster, or other material, I proceed to take a cast in sand or loam of the exact shape, in iron or other metal, which is the part used to form one side of the share, and that gives the hardiness

and temper to the same. The other side of the share is formed in a flask of wood or metal, with sand or loam, in the common way of moulding the same article. These two parts are fastened together by screws, weights, or such other means, as may be used to serve the purpose of confining the moulds together while the metal is pouring therein. The socket (or tray) of the share is formed by an iron or metal plug the shape of said socket or tray being inserted into the mould, by which means the socket is certain of being smooth, and exact in size and shape.

Secondly.—Scarifiers and hoes may be cast in a similar manner to the shares.

N. B. Should it be required to make both sides of the shares, scarifiers, or hoes, hard, and the inner part soft, then both sides of the mould or matrix must be made of iron or other metal.

Any other articles wherein the above described properties are desirable may be made in the same manner.

In witness whereof, &c.

Experiments on extreme Branch-grafting of Fruit-Trees. By William Fairman, *Esquire, of Miller's House, near Sittingbourn, in Kent.*

With a Plate.

From the Transactions of the Society for the Encouragement of Arts, Manufactures, and Commerce.

The Silver Medal was presented to Mr. Fairman *for this Communication.*

FROM much conversation with Mr. Bucknall on the idea of improving standard fruit-trees, we could not but remark that in apple-orchards, even in such as are most valuable,

valuable, some were to be seen that were stinted and barren, which not only occasioned a loss in the production, but made a break in the rows, and spoiled the beauty and uniformity of the plantation.

To bring these trees into an equal state of bearing, size, and appearance, in a short time, is an object of the greatest importance in the system of orcharding, and also for the recovery of old barren trees, which are fallen into decay, not so much from age as from the sorts of their fruits being of the worn-out and deemed nearly lost varieties.

Having long entertained these thoughts, and been by no means inattentive to the accomplishment of the design, I attempted to change their fruits by a new mode of engrafting, and am bold enough to assert, that I have most fortunately succeeded in my experiments; working, if I am to be allowed to say it, from the errors of other practitioners, as also from those of my own habits.

Having many trees of this description, I made an experiment on three of them in March, 1798, each being nearly a hundred years old. They were not decayed in their bodies, and but little in their branches. Two of these were golden-pippins, and the other was a golden-rennet. Each likewise had been past a bearing state for several years. I also followed up the practice on many more the succeeding spring, and that of the last year, to the number of forty at least, in my different plantations *.

I directed the process to be conducted as follows: cut out all the spray wood, and make the tree a perfect skeleton, leaving all the healthy limbs; then clean the branches, and cut the top of each branch off where it

* The average expense I calculated at 2s. 6d. each tree.

O 2 would

would measure in circumference from the size of a shilling to about that of a crown-piece. Some of the branches must of course be taken off where it is a little larger, and some smaller, to preserve the canopy or head of the tree; and it will be necessary to take out the branches which cross others, and observe the arms are left to fork off, so that no considerable opening is to be perceived when you stand under the tree, but that they may represent an uniform head. I must here remark to the practitioner, when he is preparing the tree as I directed, that he should leave the branches sufficiently long to allow of two or three inches to be taken off by the saw, that all the splintered parts may be removed.

The trees being thus prepared, put in one or two grafts at the extremity of each branch; and from this circumstance I wish to have the method called *extreme branch-grafting*.

A cement, hereafter described, must be used instead of clay, and the grafts tied with bass or soft strings. As there was a considerable quantity of moss on the bodies and branches of the trees, I ordered my gardener to scrape it off, which is effectually done when they are in a wet state by a stubbed birch broom. I then ordered him to brush them over with coarse oil, which invigorated the growth of the tree, acted as a manure to the bark, and made it expand very evidently; the old cracks were soon, by this operation, rendered invisible.

All wounds should be perfectly cleaned out, and the medication applied as described in the Orchardist, p. 14. By the beginning of July the bandages were cut, and the shoots from the grafts shortened, to prevent them from blowing out. I must here too observe, that all the shoots or suckers from the tree must enjoy the full liberty of growth till the succeeding spring, when the greater

part

part must be taken out, and few but the grafts suffered to remain, except on a branch where the grafts have not taken: in that case, leave one or more of the suckers, which will take a graft the second year, and make good the deficiency. This was the whole of the process *.

By observing what is here stated, it will appear that the tree remains nearly as large when the operation is finished, as it was before the business was undertaken; and this is a most essential circumstance, as no part of the former vegetation is lost, which is in health fit to continue for forming the new tree.

It is worthy of notice, that when the vivifying rays of the sun have caused the sap to flow, these grafts, inducing the fluid through the pores to every part of the tree, will occasion innumerable suckers or scions to start through the bark, which, together with the grafts, give such energy to vegetation, that in the course of the summer the tree will be actually covered over by a thick foliage, which enforces and quickens the due circulation of sap. These, when combined, fully compel the roots to work for the general benefit of the tree.

In these experiments I judged it proper to make choice of grafts from the sorts of fruits which were the most luxuriant in their growth, or any new variety, as described in the 17th and 18th volumes of the Society's Transactions, by which means a greater vigour was excited; and if this observation is attended to, the practitioner will clearly perceive, from the first year's growth, that the grafts would soon starve the suckers which shoot forth be-

* The system succeeds equally well on pears, as also on cherry trees, provided the medication is used to prevent the cherry tree from gumming.

low

low them, if they were suffered to remain *. With a view to accomplish this grand object of improvement, I gave much attention to the general practice of invigorating old trees; and I happily discovered the error of the common mode of engrafting but a short distance from the trunk or body, as in Fig. 1, (Plate VI.) There the circumference of the wounds is as large as to require several grafts which cannot firmly unite and clasp over the stumps, and consequently these wounds lay a foundation for after-decay. If that were not the case, yet it so reduces the size of the tree, that it could not recover its former state in many years, and it is dubious if it ever would; whereas, by the method of extreme grafting, as Fig. 3, the tree will be larger in three or four years than before the operation was performed. For all the large branches remaining, the tree has nothing to make but fruit-bearing wood; and from the beautiful verdure it soon acquires, and the symmetry of the tree, no argument is necessary to enforce the practice.

Fig. 2, was my first experiment about eight years since. The error of No. 1 was there a little amended, and gave me the idea of engrafting at the extremity. Permit me to remark, that those done in my orchards, on the plan of Fig. 2, did not, neither were they able to bear so many apples last season, which was a bearing year, as those on the plan of Fig. 3, which produced me about two bushels, each tree, of the finest fruit I had in my orchards, from the third summer's wood only. Some engrafted with Ribston pippins were beautiful.

Mr. Bucknall visited me this summer, for the express purpose of seeing my trees; and he says the manner of conducting

* This thought should be kept in suspense, as ten years hence it may appear otherwise. However, they will be valuable trees, and highly profitable, as will any other brought under the same system.

conducting the system is the happiest that ever was conceived. For when a tree has done its best, and has continued to extreme old-age, just disposed to fall into dissolution, as also when this is the case with trees in a stagnated and barren state, they are thus renovated, and may, with the greatest probability, continue valuable for fifty years to come. I need not say, do not make the attempt when the energy of growth is over; that will easily be seen by the body and arms, but more particularly from the size, figure, shape, and colour of the leaves, which give the proper indication of health or decay in vegetation.

Cement for Engrafting.

One	pound of	pitch	To be boiled up together, but not to be used till you can bear your finger in it.
One	ditto	resin	
Half	ditto	beeswax	
Qtr.	ditto	hogslard	
Qtr.	ditto	turpentine	

REFERENCES TO PLATE VI.

Fig. 1, displays the old practice, commonly called Cleft-grafting.

Fig. 2, improved experiment on Fig. 1, by engrafting higher up the tree.

Fig. 3, shews the method of extreme branch-grafting, recommended, from experience, by Mr. Fairman. Two grafts or cyons are there placed at the extremity of each branch; besides which, additional grafts are inserted in the sides of the branches, as at A, or where they are wanted to form the tree into a handsome shape.

Fig. 4, shews, upon a larger scale than the former figures, the method of applying the grafts at the extremity of the branches, and retaining them by the bass-mat bandage and cement.

Extract

Extract of a Letter from Mr. T. S. D. Bucknal.

The system of extreme branch-grafting, now introduced by Mr. Fairman, he has had in contemplation full eight years, though not in its present style of success and elegance; for he has been improving. In those operated upon within the last three or four years he has been wonderfully successful; and I am happy in an opportunity of adding my testimony to the advantages resulting from this method of renovating old fruit-trees.

An idea, equal to the present system, could not have fallen into better hands than those of Mr. Fairman. He is blessed with a good soil, cultivates the land well, and steadily attends to improvement. The gentlemen of the committee, by looking at the three little sketches of drawings which represent the three trees, will see that Fig. 1 is so amputated, as not likely to continue in health, so as again to form a good tree; and that Fig. 2 will be many years before, if ever it does. But there are now many fine large trees in the state of Fig. 3, which have been engrafted but three or four years, and yet, as far as structure goes, are complete already, and in two years much fine fruit may be expected.

The system is as follows: Make the trees perfectly clean, and keep them as uniformly large as is convenient.

In autumn, 1801, I spent some days at Lynsted, and several times walked over the plantations with Mr. Fairman, and was very much pleased with their appearance.

Method

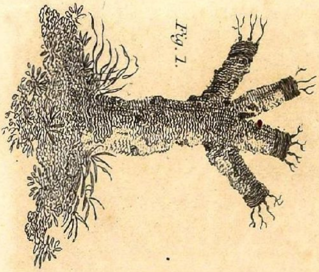


Fig. 1.

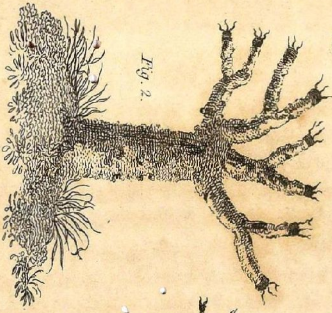


Fig. 2.

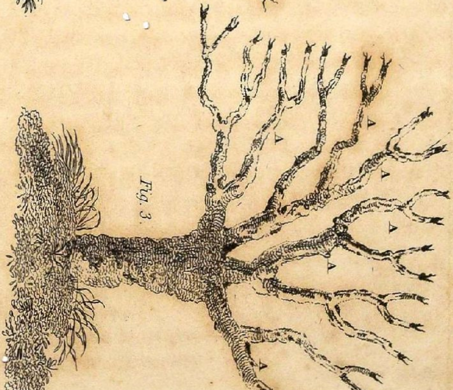


Fig. 3.

Fig. 4.

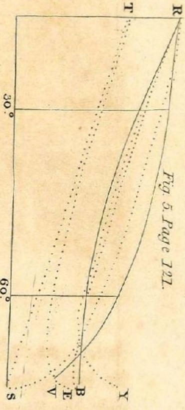


Fig. 5. Page 121.

Method of dying Cotton-Yarn a fixed Turkey Red.

By M. Pierre Jaques Papillon.

The commissioners and trustees for manufacturers, &c. in Scotland, in the year 1790, paid a premium to Pierre Jaques Papillon, a native of France, for communicating to Dr. Black, then professor of chemistry, Edinburgh, the process followed by him for dying cotton-yarn a fixed Turkey red, on condition that it should remain a secret for a certain term of years, during which term Mr. Papillon should have the sole benefit of his secret; that term being now expired, the trustees have ordered the communication, as originally made to Dr. Black, to be published for the information of all concerned, as follows, *viz.*

Receipt for dying Cotton-Yarn a durable Red.

Step I.

For one hundred pound cotton you must have,

100 lb. of alicante barilla.
20 lb. of pearl-ashes.
100 lb. of quick-lime.

The barilla is mixed with soft water in a deep tub, which has a small hole near the bottom of it, stopped at first with a peg. This hole was covered in the inside with a cloth, supported by two bricks, that the ashes may be prevented from running out at it, or stopping it up while the ley filters through it.

Under this tub is another, to receive the ley, and pure water is repeatedly passed through the first tub to form leys of different strength, which are kept separate at first, until their strength is examined. The strongest required for

for use must swim or float an egg, and is called the ley of six degrees of the French hydrometer, or *perseliqueur*. The weaker are afterwards brought to this strength by passing them through fresh barilla; but a certain quantity of the weak, which is of two degrees of the above hydrometer, is reserved for dissolving the oil, the gum, and the salt, which are used in subsequent parts of the process. This ley of two degrees is called the weak barilla liquor; the other is called the strong.

Dissolve the pearl-ashes in ten pails of four gallons each of soft water, and the lime in fourteen pails.

Let all the liquors stand till they become quite clear, and then mix ten pails of each.

Boil the cotton in the mixture five hours, then wash it in running water and dry it.

Step II.—*Bainbie, or Grey Steep.*

Take a sufficient quantity (ten pails) of the strong barilla water in a tub, and dissolve or dilute in it two pails-full of sheeps dung; then pour into it two quart bottles of oil of vitriol, and one pound of gum-arabic, and one pound of sal-ammoniac, both previously dissolved in a sufficient quantity of weak barilla water; and, lastly, twenty-five pounds of olive-oil, which has been previously dissolved, or well mixed with two pails of the weak barilla water.

The materials of this steep being well mixed, tramp or tread down the cotton into it until it is well soaked: let it steep twenty-four hours, then ring it hard, and dry it.

Steep it again twenty-four hours, and again wring and dry it.

Steep it a third time twenty-four hours, after which wring and dry it; and, lastly, wash it well and dry it.

Step

Step III. — *The White Steep.*

This part of the process is precisely the same with the last in every particular, except that the sheeps dung is omitted in the composition of the steep.

Step IV. — *Gall Steep.*

Boil twenty-five pounds of galls, bruised in ten pails of river water, until four or five are boiled away; strain the liquor into a tub, and pour cold water on the galls in the strainer, to wash out of them all their tincture.

As soon as the liquor is become milk-warm, dip your cotton hank by hank, handling it carefully all the time, and let it steep twenty-four hours.

Then ring it carefully and equally, and dry it well without washing.

Step V. — *First Alum Steep.*

Dissolve twenty-five pounds of Roman alum in fourteen pails of warm water, without making it boil; skim the liquor well, and add two pails of strong barilla water, and then let it cool until it be luke-warm.

Dip your cotton, and handle it hank by hank, and let it steep twenty-four hours, wring it equally, and dry it well without washing.

Step VI. — *Second Alum Steep*

Is performed in every particular like the last, but after the cotton is dry steep it six hours in the river, and then wash and dry it.

Step VII. — *Dying Steep.*

The cotton is dyed by about ten pounds at once, for which take about two gallons and a half of ox blood, and mix it in the copper with twenty-eight pails of milk-warm water, and stir it well; then add twenty-five pounds of

 madder,

madder, and stir all well together. Then having before hand put the ten pounds of cotton on sticks, dip it into the liquor, and move and turn it constantly one hour, during which gradually increase the heat until the liquor begins to boil at the end of the hour. Then sink the cotton, and boil it gently one hour longer, and lastly wash it and dry it.

Take out so much of the boiling liquor, that what remains may produce a milk-warm heat, with the fresh water with which the copper is again filled up, and then proceed to make up a dying liquor, as above, for the next ten pounds of cotton.

Step VIII. — *The Fixing Steep.*

Mix equal parts of the grey-steep liquor and of the white-steep liquor, taking five or six pails of each.— Tread down the cotton into this mixture, and let it steep six hours, then wring it moderately and equally, and dry it without washing.

Step IX. — *Brighton Steep.*

10 lb. of white soap must be dissolved most carefully and completely in sixteen or eighteen pails of warm water; if any little bits of the soap remain undissolved they will make spots in the cotton. Add four pails of strong barilla water, and stir it well. Sink the cotton in this liquor, keeping it down with cross sticks, and cover it up, boil it gently two hours, then wash it and dry it, and it is finished.

Vessels.

The number of vessels necessary for this business is greater in proportion to the extent of the manufactory; but in the smallest work it is necessary to have four coppers, of a round form.

1st. The

1st. The largest, for boiling and for finishing, is twenty-eight inches deep, by thirty-eight or thirty-nine wide in the mouth, and eighteen inches wider in the widest part.

2d. The second for dying is twenty-eight deep, by thirty-two or thirty-four in the mouth.

3d. The third, for the alum steep, is like the second.

4th. The fourth, for boiling the galls, is twenty deep, by twenty-eight wide.

A number of tubs, or larger wooden vessels, are necessary, which must all be of fir, and hooped with wood or with copper.

Iron must not be employed in their construction, not even a nail; but where nails are necessary, they must be of copper.

By the pail is always understood a wooden vessel, which holds four English gallons, and is hooped with copper.

In some parts of the above process, the strength of the barilla liquor or liquors is determined by telling to what degree a *perseliqueur* or hydrometer sinks in them.

The *perseliqueur* was of French construction. It is similar to the glass hydrometer used by the spirit-dealers in this country; and any artist who makes these instruments will find no difficulty in constructing one with a scale similar to that employed by M. Papillon, when he is informed of the following circumstances:

1st. The instrument, when plunged in good soft water, such as Edinburgh pipe water, at temperature 60 deg. sinks to the 0, or beginning of the scale, which stands near the top of the stem.

2d. When it is immersed in a saturated solution of common salt, at the same temperature of 60 deg. it sinks to the 26 degree of the scale only, and this falls at some distance from the top of the ball.

This

This saturated solution is made by boiling, in pure water, refined sea or common salt, till no more is dissolved, and by filtering the liquor when cold through blotting paper.

It should also be observed, that whenever directions are given to dry yarn, to prepare it for a succeeding operation, that this drying should be performed with particular care, and more perfectly than our driest weather is in general able to effect. It is done therefore in a room heated by a stove to a great degree.

Appendix to Sir JOHN SINCLAIR's *Essay regarding Cattle.*

(See our last Number, Page 36.)

On the different Kinds of Cattle Farms.

CATTLE farms may be classed under the following heads: 1. Breeding farms. 2. Dairy farms. 3. Grazing farms. 4. Suckling farms. And, 5, farms where cattle are worked. A few cursory observations on each, is all that the limits of this paper will admit of.

I. *Breeding Farms.*—In breeding cattle, it is proper (if the size of the farm will permit the rule being observed) to separate the different ages, and to graze them, as much as possible, in distinct pastures; as the older ones have a jealousy of the younger, driving them from the best grass, and sometimes doing them a material injury.

Bulls will in general retain their vigour till they are twelve or fourteen years old, and there are instances of their being kept till they are even nineteen years, but they are certainly in their prime from three to six. They ought

ought to be kept in one field, which prevents their rambling; and the cows should be brought to them. But it is still a better plan to work the bulls with the oxen, as the owner has thereby the profit of their labour, and all risk of their doing mischief is prevented.

Mr. Bakewell used to put off sending his heifers to the bull till three years old, but his cows often missed calf, which might be owing to that circumstance. It is better, therefore, to send them to the bull at two years old, and some recommend strongly even an earlier period *. In the northern counties, they wish their cows to calve when the grass is abundant. This, it is supposed, opens their milk vessels, and is a great means of rendering them ever after good milkers; which is not the case, unless nature is early made to have a tendency to that species of secretion. It has been found a good plan to give the whole of the milk a young cow yields to the calf, which she readily does, and thus gets into a good habit of milking.

Bull calves † are generally nursed by the mother, but sometimes by hand. It is said that Mr. Bakewell had two nurses for some of his favourite stock. On the other hand, in the north of England, where rearing a number of cattle is the object, they sometimes put two calves to one cow. Hay-tea ‡ is sometimes given them, and eggs in

* It is said that young cows, as early as even one year old, might be sent to the bull. If this would not stint their growth, (which good feeding might obviate,) it might be adopted in particular cases, where the dairy was an object, but certainly ought not to be a general practice.

† It has been remarked, that if a cow goes beyond her time, she generally produces a male calf.

‡ The following receipt for making hay-tea has been tried with success in the north of England. Take a large handful, or about 1 lb. of red-

in spring, when they are cheap; but linseed is the best substitute for milk. The calves are served with linseed twice a day, at the rate of an English pint of linseed, and twelve quarts of milk, for twelve calves, which, with thirty-six quarts of water, is boiled into a jelly; a gallon of this soup is given to each calf twice a day. The linseed should be crushed.

II. *Dairy Farms.*—The proper management of the dairy is a most important source of profit, in many parts of the kingdom, and perhaps ought to be extended to many districts where it is at present but little known*. In the neighbourhood of a town, the sale of the milk is, probably, the great object in keeping cows; but in the more remote parts of the country, if calves are not fattened, cheese and butter being so easily preserved and

red-clover hay, well got in, and six English quarts of clear spring water; boil the hay amongst the water, until it is reduced to four quarts; then take out the hay, and mix 1 lb. of barley, oat, or bean-meal, amongst a little water: put it into the pot, or cauldron, whilst it is boiling; keep the whole constantly stirring, until it is boiled and thickened. Let it cool, to be luke-warm; then give it to the calf, adding as much whey as will make a sufficient meal. This is a cheap mode of rearing calves, and may answer the purpose as well as more costly ingredients. In this way the valuable article of milk may be saved for other purposes,

* I regret much to hear, that in many parts of England the advantages of the dairy are not so well known as they ought to be; and that the lower orders of the people cannot get a little milk, or butter-milk, for their children. I wish much to call the attention of the liberal and public-spirited country gentlemen, to a circumstance so important to so numerous a class of the community. The best remedies are, to have small dairy farms in the neighbourhood of all villages, bound to furnish the inhabitants with milk, at a moderate price; and if the Irish mode were adopted by the English farmers, of churning all the milk, instead of the cream alone, such a supply of excellent butter-milk would be procured as would be of infinite service to their neighbourhood.

transported,

transported, are the proper articles to attend to, with the view of domestic consumption, or of foreign export.

The points to be principally attended to by any person who sets up a dairy, are, 1. To get a proper breed of milch cows. 2. To procure an attentive and skilful dairy-maid; as the whole success of the undertaking must depend on her good conduct *. And, 3. To ascertain whether the milk produced by the pastures in his possession, is best calculated for making butter or cheese.

The proper hours of milking, and how often *per* day cows ought to be milked, are points of considerable importance. It is certain that some cows require being milked thrice a day, in the prime of the season; but, as a general rule, it seems to be most adviseable to milk but twice a day, at six o'clock in the morning and six at night. In this way a cow has twelve hours each time to graze, or feed, and to prepare the milk for the pail. When they are milked thrice a day, it occasions much unnecessary trouble to the dairy-maids, not only in going to the cows, but also in preparing their vessels for holding the milk, unless they have an extraordinary number of them: it also puts the cows from grazing, and diminishes their time for rest †. The dairy-maid should take special care to treat the cows with as much gentleness and kindness as possible, to prevent their taking any dis-

* Good dairy-maids are so extremely scarce in many parts of the kingdom, that it would be proper to encourage them, by premiums at present applied for purposes much less essential.

† Since this was written, I have perused Dr. Anderson's Recreations, vol. III. p. 248, 249, &c. in which there are a number of valuable hints on the subject of the dairy, and in particular regarding the times of milking, respecting which there seems to be a degree of doubt, which nothing but careful and judicious experiments can properly remove.

like to her, which would hinder their milking well; and should milk them completely, by which cows are prevented from going so soon dry, as otherwise may be apprehended.

The usual process of making butter and cheese, and the purposes to which the whey may be applied, are so well known, that it is unnecessary here to describe them *.

Cows are not at their prime state for milk until they are six or seven years old, and they will remain so until

* The following particulars may be worth preserving in a note. Though fresh butter must be made with great care, yet salt butter requires, if possible, still greater attention, as it must be calculated for preservation; and though salt is indispensable for that purpose, yet if the butter is properly prepared, and the salt properly mixed, the quantity required is not considerable. It is said that the butter made in the months of May, June, July, and August, is the fittest for salting; and that butter made in the latter part of the season will not take salt so well. In regard to cheese, in order to make it rich, they sometimes mix fine tallow with it, and sometimes butter: the latter mode is practised in the northern parts of Scotland. Sometimes also, farmers, in the northern parts of England, make what are called egg cheeses, which are famous for toasting. After the curd is thoroughly prepared, they make this cheese, by putting five yolks of eggs to every pound of curd, mixing the whole properly, and putting it into the cheese-press as usual. As to whey, it is sometimes used for making butter, sometimes for feeding swine or calves, and sometimes prepared in the north of England in the following manner. The whey is put into a kettle or pot on a smartish fire, and when it is near boiling some butter-milk is put into it, which is skimmed off as soon as any curd seems to be formed on the top of the whey, some butter-milk is then again put in, and so on, from time to time, as long as any curds will arise. This substance is called whey-curds, may be eat with cream or milk, and is not unpalatable diet. The whey that remains from this curd is commonly called whig, and, when kept until it is sour, and two or three sprigs of mint put into it, many are of opinion that it makes a pleasant liquor, particularly in hot weather.

they

they are twelve; but as the older they grow the worse they will fatten, some farmers begin to feed them, when they are from eight to ten, even though they are good milchers. The propriety of this system may, however, be questioned. Whilst the value of the udder, in a good dairy cow, exceeds the value of the cow, her pasture, and the necessary attendance, she may be kept to any age. The teeth, not the stomach, fail; and therefore, as long as a cow milks well, she ought to be kept, as she can always be fattened by soft meat.

It has been remarked, that some cows will give a large quantity of milk, yet will yield little or no butter; and that a mixture of it will even prevent the cream of the other cows from churning. This is owing either to the animal being in an unhealthy state, or to a predilection for particular kinds of herbage, not favourable to the production of good milk.

III. *Grazing Farms.* Some intelligent graziers recommend the following mode for feeding and fattening cattle. Suppose there are four inclosures, of from six to ten acres each, one of them should be kept quite free from stock till the grass has got up; and then the prime or fattening cattle should be put into it, that they may get the best of the food; the second best should then follow; and the young store after all; making the whole feed over the inclosures in succession, as follows:

1. Inclosure.	Free from stock, till ready for the best cattle.
2. Ditto.	For the best cattle, till sent to No. 1.
3. Ditto.	For the second best, till sent to No. 2.
4. Ditto.	For the young cattle, till sent to No. 3.

No. 4 is then kept free from stock till the grass gets up, and it is ready for the prime cattle.

 The

The proper size of inclosures has never yet been ascertained by experiment; probably from ten to thirty acres the best, but the size should be various, as small ones are best in winter, and large ones in summer, and small ones are best calculated for grass, and large ones for corn. Mr. Bakewell was a friend to small inclosures. Probably the best plan to adopt is, to feed cattle entirely in the house, or *soiling* them, as it is technically called. In that case small inclosures must be preferred, as the shelter they afford is extremely favourable to the growth of herbage.

In grazing cattle in the fields, two practices are recommended. 1. When hay is given them, or straw, instead of throwing it on the ground, which tempts the stronger to drive away, and even to gore and hurt the weaker; it is better to place it in small square pailings, according to the number of cattle in the field, so that each may have a distinct side to go to, without interfering with his neighbours. 2. When cattle are kept out during winter, it is a useful practice to rub some tar at the root of the horn, which hinders any wet from getting between the root and the skin, and it is said contributes to preserve the health of the animal, and to prevent various diseases to which it may otherwise be liable.

The larger a bullock is, he must take the more food to support him. It is desirable to change his food often, and to give him frequently, but little at a time, which makes him more eager to eat. After his kidnies are covered with fat he will take less meat every week. It is better therefore to ascertain the quantity he eats by the week than by the day.

Fatting cattle to be sold immediately from the farmer's house, and not sent to market, should be kept moderately warm. If kept too hot, it makes them perspire, and

and their skins to itch: this vexes them, and they rub themselves against any wall or post within their reach, which is much against quick feeding. Currying and combing them are useful practices; and washing them, at least once a week, is of great service. Bleeding is now exploded, as an old and unnecessary practice.

IV. *Suckling Farms.* In some parts of the kingdom, the whole attention of the farmer is dedicated to suckling, or, in other words, to feeding calves for supplying the market with veal. In Essex this plan is reckoned more profitable than the dairy, and next to grazing. But the profit there must depend much upon the immediate neighbourhood of that county to so great and certain a market as London,

The particulars connected with this branch of rural economy will, it is probable, be fully detailed in the Improved Agricultural Survey of Essex, in so far as regards that and the neighbouring districts. But as the mode of suckling adopted in some parts of Scotland is extremely different, it may not be improper to give a short account of it in this place.

As soon as the calf is dropped, it is put into a box made of coarse boards, four and a half or five feet long, and four, or four and a quarter feet high, and about two feet wide, according to the size of the calf. The boards are not put so close but that a sufficient quantity of air is admitted; light is, however, carefully excluded, and the box has a cover for that purpose *. The box stands on four feet, which at one end are four inches high, but at the other only two inches, and, as there are holes at

* All animals when fattening ought to be excluded from light as much as possible, as the best and safest mode of keeping them quiet; and infinitely preferable to soporific drugs, which are commonly given them. Exclusion from light is practised by those who fatten poultry for the London market with much success.

the

the bottom, all wetness is drained off. The bottom is also covered with straw or hay, which is changed twice a week. For seven or eight days milk is but cautiously given, for, unless a calf is fed moderately at first, it is apt to take a loathing to its food. It should be bled in about ten days, and afterwards as much milk given it, fresh from the cow, either twice or thrice a day, as it will take. The bleeding should be repeated once a week; and at all times when a calf loaths his milk, and does not feed well, bleeding ought to be repeated. These frequent bleedings prevent diseases from plethora, to which calves are subject, even when not fed so high, and still more so when they are. A large piece of chalk should be hung up in the box, which the calf will lick occasionally: this contributes nothing to the whiteness of the veal, but it amuses the animal, and corrects that acidity in the stomach which might otherwise be engendered, and which certainly often takes place. A cow calf is reckoned the best for veal: if a bull calf is suckled, he ought to be cut when about a week old, otherwise the veal will neither be so good nor so white. By this mode of treatment calves are kept clean, quiet, warm, and dry; the veal they furnish is excellent, and they are soon ready for the market *; and, on the whole, it seems to be preferable to the practice of stupifying them with spirits, or with laudanum, so common in other places, where a different system is pursued.

V. *Farms where Cattle are worked.* The supposed necessity of beginning to feed oxen at an early age, is a great objection to their being generally used, as they are

* Statistical Account of Scotland, vol. VIII. p. 199, Vol. IX. p. 384, and, in particular, vol. XIX. p. 495, where an account of this mode is given, by a respectable country gentleman, Mr. Paterson, of Castle-Huntly.

hardly

hardly trained properly to work before it is thought necessary to fatten them, after which they do very little work: but, in consequence of the improved mode of fattening by oil-cake, &c. there is no difficulty to fatten oxen, even at twelve years of age, which is a material circumstance in their favour.

It is thought best to begin to break in oxen at three years old, and to give them full work at four. In the northern counties of England, four oxen are commonly used, the two foremost in harness, the other two in yokes. In Scotland it is not uncommon to work two oxen in harness, and without a driver. They are sometimes worked till they are from eight to ten, and even twelve years of age: but it is generally considered to be more profitable to begin to feed them earlier.

Some people prefer free martins * and spayed heifers for working to oxen. They are found very strong and active, and it is said they will, with equal feeding, work nearly as well as a horse.

It is a remark of the late Sir Charles Turner, that the advantage of working oxen depended much upon the breed; and he preferred much the Lancashire sort, as they were not only active and hardy, but lengthy in the carcase, which enable them to go four inches farther each step than almost any other kind.

They have much experience in working oxen in the East Indies; for, besides what are used in husbandry, great numbers attend the armies on all expeditions, for the purpose of dragging the artillery, and conveying ammunition, baggage, and provisions. It is observed in the East, that small oxen will travel much faster than

* Free martins are cow calves cast at the same time with bull calves, which are never known to breed.

large

large ones, and will bear more fatigue. Light oxen, with little food, will continue to work until they fall down, but the heavy ones will do nothing unless they are well fed. The heavy ones are stronger, but they are generally slow and surly, and can hardly be made to exert themselves on any occasion. It is also remarked in the East, that oxen ought never to be worked when their bellies are full, nor should water be given them, either on a march or when they are at work, if the weather is hot.

I cannot conclude these cursory hints, without adverting to a most interesting subject, namely, the diseases of cattle, and the means of their prevention or cure, inquiries regarding which are so well entitled to public attention and encouragement, instead of being left, as hitherto has been the case, to the desultory exertions of private individuals. The stock of domestic animals in a country, is one of the principal sources of its wealth; and every circumstance that materially tends to diminish their number, or to decrease their value, must be attended with much public loss. Animals are in general subjected to much fewer disorders than men; and as their diseases are of a much less complicated nature, they are consequently much easier relieved. There can be little doubt, therefore, that very moderate public encouragement would be the means of discovering those remedies that would be found the most effectual for their removal. Is it possible for the public money to be better bestowed? It is said that a very effectual remedy for the rot in sheep *

* An intelligent correspondent informs me, that it is a custom with some farmers to pasture their sheep on ground abounding with broom, for several days, when the broom is in blossom, which they find from experience prevents the sheep so pastured from being infected with the rot for that season.

has

has been discovered in Holland, yet no pains are taken to procure a knowledge of it in this country, though that disease has occasioned the loss of many millions of property to the subjects of Great Britain within these fifty years past. If that loss had not been sustained, would not the wealth of the country have been considerably augmented, its public revenue consequently increased, and of course great quantities of human food have been preserved from destruction, which have perished, to the manifest injury of the nation!

Remarks on the Resistance of Fluids. By Dr. YOUNG.

From the JOURNALS of the ROYAL INSTITUTION of GREAT BRITAIN.

MR. Lacroix has inserted in the Bulletin de la Société Philomathique, a comparative view of the experiments of Mr. Bossut and of Mr. Vince, on the resistance of fluids striking on oblique surfaces. He does not appear to have assigned a sufficient reason for the difference of the results of those experiments; but the subject is of so much importance, as to deserve such an examination in its present state as may serve to assist in the prosecution of farther experiments.

The first approximation to a determination of the effect of the resistance to a body of a given section, terminated by oblique planes, is to suppose each particle of the fluid to impinge once on the surface, and then to retire for ever: on this supposition, the resistance ought to vary as the square of the cosine of the angle of incidence.

Another part of the resistance is occasioned by the adhesion of the particles of the fluid; this may be supposed

to vary, as the product of the secant and the sine of the angle of incidence; that is, as its tangent.

A third part depends on the form of the posterior surface of the body, and upon the unknown irregularities produced in the motions of the particles of the fluid, by the difference of the forms of its anterior part. It may be expected, that this negative pressure will be nearly uniform, when the shape of the posterior part of the body remains unaltered, as in Bossut's experiments; but that, when a thin surface is employed, as in Mr. Vince's apparatus, it will be somewhat diminised by the obliquity of that surface, even supposing the transverse projection of the surface to remain unaltered. This portion, however, may naturally be expected to be liable to great irregularities; and it appears to be somewhat increased when the thin surface is inclined in a small angle only.

In order to inquire how far these suppositions agree with the experiments, we may examine the curves of which the ordinates express the resistances. And if we make the abscisses equal to the squares of the cosines, the figure corresponding to the first part of the resistance will be a triangle. To this we may add a figure, of which the ordinates are in proportion to the tangents, and by comparing the results with the curves deduced from experiment, we may find what remains to be explained by the third supposition of a negative pressure, and other accidental irregularities.

Thus the ordinates of the curves R, B, and R, V, (see Fig. 5, Plate VI.) may represent the resistances determined by Bossut and Vince respectively: those of the line T, S, the first portion, proportionate to the square of the cosine; the distance between this line and T E, the second portion, proportionate to the tangent; and the distance between T V, and the former curves, the

third

third portion, which, in Bossut's experiments, appears to decrease slowly, and almost regularly, while the obliquity increases, as might be expected from the analogy of other experiments. In those of Mr. Vince, on the contrary, this regularity is lost.

We may obtain a simple approximation to the results of Bossut, by neglecting the third portion, and adding to the square of the cosine one-tenth of the tangent: this approximation is represented by the curve R Y, which is tolerably accurate, as far as 70° of inclination. Mr. Eytelwein's formula (Journals, vol. I. p. 149,) gives the curve R E.—The simple ratio of the cosines, represented by the curve R S, approaches nearer to the results of Mr. Vince's experiments than any of the other determinations.

I have before observed, that the resistance opposed by a fluid, to the motion of a surface moving obliquely through it, might be divided into three portions; arising respectively from impulse, from tenacity, and from negative pressure; and that in such experiments as those of Bossut, where the posterior part of the substance remains unaltered, the negative pressure might be supposed to be nearly constant, the resistance from tenacity to vary as the tangent of the angle of incidence, and the effect of impulse nearly as the square of its cosine.

Mr. Romme has remarked, that the facility with which the particles of the fluid can escape before the moving body, is proportional to the angular space of the fluid which remains open to admit them, and that therefore the resistance must vary in proportion to this angle. Without allowing the truth of the observation in its whole extent, we may with propriety inquire, whether or no the portion of the pressure derived from impulse may not in part depend on some simple function of the angle of

R 2 incidence;

incidence; and whether the whole resistance to an oblique surface may not be considered as composed of a constant portion, a portion varying with the tangent of the angle of incidence, and a third portion proportionate to the square of the cosine, diminished in the ratio of a power, or other function, of the angle of incidence. And it will appear upon inquiry, that if we take one-fifth of the radius, increased by one-twenty-fifth of the tangent, and add to it four-fifths of the square of the cosine, diminished in the ratio of the circumference of a circle increased by the angle of incidence, to the simple circumference, we may approach always within about one-fiftieth to the number expressing the oblique resistance, until the angle of incidence becomes greater than 80°. Thus, the direct resistance being unity, and a the angle of incidence, the oblique resistance will be $.2 + .04 t.a + 288(\cos.a)^2 : (360 + a^\circ)$. A formula, somewhat more accurate than this, deduced from experiment only, is $r = (\cos.a)^2 + .0000004217 a^{3.18}$; the quantity added to the square of the cosine being a little less than the millionth of the cube of the angle of incidence, expressed in degrees. The results of these two theorems are compared with the experiments of Bossut, in the following table.

Angle.	$(\text{Cos}.a)^2$	T. a.	Form. 1.	Form. 2.	Bossut.
0°	1.0000	.000	1.0000	1.0000	1.0000
6	.9890	.105	.9824	.9891	.9893
12	.9568	.212	.9492	.9580	.9578
18	.9045	.325	.9022	.9086	.9084
24	.8346	.445	.8438	.8449	.8446
30	.7500	.577	.7769	.7710	.7710
36	.6544	.726	.7049	.6919	.6925
42	.5523	.900	.6317	.6135	.6148
48	.4478	1.111	.5606	.5414	.5433
54	.3455	1.376	.4985	.4816	.4800

60°

Angle.	$(\text{Cos.}a)^2$	T. a.	Form. 1.	Form. 2.	Bossut.
60	.2500	1.732	.4407	.4403	.4404
66	.1654	2.346	.3924	.4231	.4240
72	.0955	3.078	.3869	.4344	.4142
78	.0432	4.705	.4166	.4816	.4063
84	.0109	9.514	.5875	.5658	.3999

Mr. Romme found, by numerous experiments, that when the magnitude of the greatest section of a floating body, and its distance from the angular points, were constant, the form of the outline of any section of the body, whether composed of right lines, or of curves of any kind, was either wholly, or very nearly, indifferent to the magnitude of the resistance: hence he infers, that in the construction of ships, the curve of the sides ought to be determined from considerations independent of the resistance.

In experiments like those of Mr. Vince, the circumstances are materially different: but the accuracy of Mr. Vince's experiments on water is, in some measure, confirmed by a comparison with those of Schober, which were made in a similar manner on air. The results of both these investigations are here exhibited in a table, and compared with a coarse approximation from this formula $r = .4 + .6\,(\cos. a)$.

Angle.	Cos. a.	Form 3.	Schober.	Vince.
0°	1.0000	1.0000	1.0000	1.0000
10	.9848	.9909	.9854	.9787
20	.9397	.9638	.9808	.9743
30	.8660	.9196	.9200	.9463
40	.7660	.8596	.8308	.8729
50	.6428	.7857	.7563	.7869
60	.5000	.7000	.6738	.6610
70	.3420	.6052	.6359	.4913
80	.1736	.5042	.5833	.2779

Method

Method of obtaining perfectly pure Metallic Cobalt.

By M. TROMMSDORFF.

From the JOURNAL DE CHIMIE.

MIX one pound of the best safflower with four ounces of nitrate of potash and two ounces of pulverized charcoal, and throw this mixture, in small portions, into a red-hot crucible. Repeat the operation three times; after the third time leave the matter exposed for an hour to a white heat; agitate it quickly, and add four ounces of black flux; then remove the crucible into the furnace, and keep it red-hot for an hour. When cold, separate the reduced part of the cobalt, which, by the treatment it has undergone, has by this time lost a great portion of its arsenic and iron, but is not yet quite pure, since it may still be easily pulverized notwithstanding its natural density is considerable. It is then mixed afresh with three times its weight of nitrate of potash; the mixture is thrown, in small portions, into an ignited crucible, which is kept red-hot for a certain time. By this last operation the iron is completely oxydated, the arsenic is converted into acid, and combined with the potash. By levigation with warm water it is cleared from all saline particles, and the oxyd of cobalt is separated by the filtre. The oxyd is dissolved in a proper quantity of nitric acid; the solution is filtered, and evaporated to dryness. Then add fresh acid, expose it to a moderate heat, dilute with a sufficient quantity of water, filtre, in order to separate the last portions of iron, precipitate with pure potash, and reduce it.

Extract

Extract from a Memoir on the febrifuge Principle of Quinquina. *By M.* Seguin.

From the Bulletin des Sciences.

THE aim of the author in this paper was to indicate the means of discovering, with certainty, the real febrifuge principle of quinquina, of distinguishing those species which contain it from those which do not, and to ascertain the quantity and quality.

Hitherto a judgment has been formed of the quality of quinquina, only by the taste and by inspection; but as those methods established no fixed data, and could not be employed with quinquina in powder, the presence of the febrifuge principle was very imperfectly ascertained by them. It was therefore an object of considerable importance to substitute for those almost illusory methods, others not only reducible to calculation, but likewise invariable. Chemical re-agents alone were capable of effecting this purpose.

M. Seguin, in consequence, began with separating the respective properties of all medicinal substances, and examined their action upon all other chemical substances. These researches led him to the discovery, that the febrifuge principle of quinquina possesses very striking characters, which place it in a class distinct by itself.

These characters are; it precipitates the solution of tan, but does not precipitate solutions of gelatine and sulphate of iron. When quinquina does not possess all these characters, it is a proof that it has been adulterated, or that it does not contain the febrifuge principle.

To

To this test the author has submitted all the kinds of quinquina that he could procure of the apothecaries and druggists of Paris and Versailles, and invariably obtained the same results. His researches have proved, that a very small quantity of genuine unadulterated quinquina is to be met with in the shops, the greater part being either destitute of the febrifuge principle or adulterated, or else of inferior quality, though not mixed with any other substance.

These results are the more important as the effect of quinquina in fevers can depend only on the greater or less quantity of the febrifuge principle it contains, and as all those kinds of quinquina which are destitute of that principle, as well as the substances that may be mixed with them, are more or less pernicious to the system.

The researches of M. Seguin, on the febrifuge principle of quinquina, having proved that most kinds of quinquina sold in the shops are either detrimental or unserviceable, being either adulterated, mixed, or destitute of the febrifuge principle, he endeavoured to obtain a febrifuge principle invariable in point of quality, more efficacious, more certain in its effects, more easily assimilated with the human system, and so cheap that the vender can have no interest in adulterating it.

For this purpose the author endeavoured to discover the real cause of fevers, and their effects; the nature of the febrifuge principle of quinquina, and its effects on the system. He submitted every chemical and medicinal substance to the action of the re-agents above mentioned for the febrifuge principle of quinquina, and examined whether those substances which contained the febrifuge principle might not likewise contain other substances

substances pernicious to the animal economy; and, by curing fevers with these remedies he convinced himself of their efficacy, confirming his theory by very numerous experiments.

The new febrifuge principle which he proposes to substitute for quinquina, as combining all the advantages of that substance without any of its inconveniences, is gelatine in a state of the highest purity.

Considered in a medical, economical, and political view, gelatine, in its application to the cure of fevers, is much more advantageous than quinquina. It causes no irritation, procures peaceful slumbers, and a gentle perspiration, keeps the body open without cholic or heart-burn; has no disagreeable taste, restores the strength, and agrees with the weakest stomach, by which quinquina would be cast up again as soon as taken.

Quinquina, on the contrary, irritates the system, prevents sleep, has a disagreeable taste, frequently causes obstructions, and is very difficult of digestion. With regard to economy, the difference between the two substances is very material; the price of gelatine, compared to quinquina, being as one to thirty-two. Gelatine, besides, is indigenous, which quinquina is not; the commerce in the latter obliging the European nations to export a considerable amount in cash, which might be kept at home by adopting the use of gelatine.

To this memoir the author has subjoined an account of thirty-seven cures, performed with gelatine in the presence of respectable physicians, and requests that commissioners may be appointed to repeat the experiments, and to draw up a report on the subject.

 The

The persons charged with this commission are, Messrs. Portal, Dessesarts, Hallé, Fourcroy, Berthollet, and Deyeux. Their experiments are made at the School of Medicine, in an apartment exclusively devoted to these researches. A considerable number of patients have already been cured; and those gentlemen will very shortly present to the Institute their first report on those cures.

Memoir on Vinous Fermentation.

(Concluded from Page 73.)

I THEN sought, with the utmost attention, in the juice gooseberries, that animal matter which I considered as the real ferment: since it was insoluble by itself, it must exist in combination with a body which held it in solution. All the reagents which I employed to precipitate it were ineffectual; I had recourse to fermentation itself, and observed, under every circumstance, the phenomena which it produces. My experiments were made upon nearly one litre of juice, filtered, and perfectly clear; the apparatus was placed in a stove, where the thermometer stood, at 20 degrees; fermentation instantly ensued; a great quantity of carbonic acid was disengaged; much froth was formed; the liquor lost its transparency, and even became so turbid as to precipitate a deposit, which increased in quantity the nearer the fermentation approached to an end. This deposit, of a yellowish-white colour, was of a glutinous nature, and insipid; it became brown in the air as it dried, and acquired a slightly acid taste. When thrown upon ignited charcoal, it burned like animal matters; and, by distillation in a small retort, it yielded a great quantity of carbonate

bonate of ammoniac, ready crystallized. It produced fermentation in sugar in a very short time. In a word, it was a matter of the same nature as yeast. I was anxious to see whether this phenomenon is general; according to my manner of reasoning, I concluded that it must be. Experience soon convinced me, that it is common to all juices in fermentation; the juice of the grape, the cherry, the pear, the peach, the apple, decoctions of barley and wheat, afford yeast by fermentation. The juice of the grape yields a greater quantity than any of the others, but less than that of gooseberries; it is likewise slower in fermenting; the cherry and the peach furnish nearly an equal quantity. The pear and the apple yield very little, and this accounts for the slowness of their fermentation. I wish I had been able to procure a greater number of fruits, that I might have made a greater number of experiments; but these are sufficient to prove, that wherever alkohol is formed a deposit of yeast is generally found. If those who still entertain doubts on the subject will take the trouble to consider the two following experiments, I think they will be convinced. I confess they have contributed in no small degree to remove the objections that I myself was continually making. I knew that honey diluted with water is gradually converted into a spirituous liquor. Cullen informs us, that the urine of the diabetes mellitus in time becomes alkoholic. I fermented both of these, and a deposit of yeast was the consequence.

I therefore repeat, that it may be considered as a demonstrated proposition, that in all kinds of spirituous fermentation a deposit is formed of animal matter, similar in every respect to yeast, possessing exactly the same properties, and particularly that of decomposing sugar, and converting it into carbonic acid and spirit of wine. This

 proposition

proposition gives rise to a new question, which naturally presents itself, and to which we must now direct our attention. Is yeast formed in the act of fermentation, or is it ready formed, and does it produce fermentation?

I must confess, that no experiments, hitherto made, positively prove that this matter alone is employed by nature to effect the conversion of sugar into alkohol and carbonic acid. For, why should it be deposited when the fermentation takes place? It may, indeed, be said, that the sugar holds it in solution; that it probably dissolves more than is required for its decomposition; and that the excess is then precipitated. But experience affords a feeble confirmation of this theory. Is this, however, a sufficient reason for totally rejecting it? Have we not many instances of compositions that require considerable time for their formation? and this is perhaps the case with the juices of fruits, where the ferment and the sugar are a long time in contact. It is certain, or at least extremely probable, that if yeast be a produce of fermentation, as it is deposed by all liquors that are fermented, it doubtless owes its origin to a soluble matter, from which it differs very little, and which produces it by its reaction upon the sugar.

Whichever of these two opinions may be confirmed by experiment, I have no doubt but that yeast is an immediate principle of vegetables, and consequently acts an important part in the phenomena both of art and nature. I am likewise persuaded, that if there exist any other matter capable of exciting fermentation, it must have a very great analogy to this; that, like yeast, it is composed of azote, oxygen, carbon, and hydrogen, and that it doubtless acts in the same manner upon sugar. I shall state, with the greatest accuracy, the properties of this matter, which I shall henceforth call ferment, and shall

particularly

particularly consider its action on the saccharine principle, that I may be able to establish the theory of fermentation. This theory, even supposing the yeast is not ready formed, but is produced in the fermenting juices, will still be useful, and susceptible of numerous applications, as will presently appear.

I shall say nothing more on the physical properties of ferment, of which I have spoken several times in this memoir; I shall only consider its chemical properties, which alone are materially interesting to us. It has no taste, does not redden the tincture of turnsol, nor turn the syrup of violets green. The putrid fermentation which it undergoes in time is similar in every respect to that of animal matter. By desiccation it loses three-fourths of its weight: this loss is entirely owing to the water it contains, and which is volatilised. When dried it is always capable of exciting fermentation; it is not in the least decomposed, and may be kept for any length of time without spoiling. Of this property we might even avail ourselves, to carry it to places remote from breweries, and with which the communication is so difficult, that it is impossible for them to receive fresh yeast, especially in summer, without being spoiled. By distillation in a small retort, and raising the fire to a melting heat, eight parts of ferment yielded 2,83 of carbon, as a residue; I obtained 1,61 of water, 1,31 of oil, and 1,46 of muriate of ammoniac; by adding muriatic acid I collected ,33 of gas, containing the fifth part of its volume of carbonic acid, and which, being separated from it by potash, burned like carbonated hydrogen, and required for its combustion ,5 more than its volume of oxygen. From this experiment it will be seen that ferment contains in particular a great quantity of carbon.

Water,

Water, at the temperature of 12 to 15 degrees, does not dissolve $\frac{1}{400}$ of ferment; it dissolves so little, that after remaining in contact several hours, and being well filtered, it scarcely acts at all upon sugar. Boiling water produces a decomposition which I shall examine in another memoir.

Nitric acid, even diluted with water to 18 degrees, likewise decomposes it, and converts it into grease; azote mixed with carbonic acid is first disengaged, and after some time nitric acid.

Potash acts upon this substance in the same manner as upon all animal matters; the phenomena of both are exactly the same; in both cases a saponaceous matter is formed, and likewise a great quantity of ammoniac which is volatilised. But of all the properties of ferment, none is so remarkable, and at the same time so useful, and none, of course, is so deserving of being studied, as its action upon sugar; it interests every class of society from the artisan to the philosopher, on account of its produce; and the latter more especially, as it may prove a fertile source of new reflections and truths. How much it were to be wished, that Lavoisier had, as he purposed, directed his attention to the subject, and had examined it with that care which he bestowed upon every thing he undertook. Who could be more capable of creating a theory of fermentation than the author of the modern theory? He was doubtless prevented by circumstances; and this theory, notwithstanding its importance to science, has, to the present time, remained vague, and founded on conjecture. Having discovered the fermentable principle, this theory naturally formed a part of my researches; and if I have not rendered it as luminous as I could wish, at least the veil with which it

was

was covered is removed, and it rests upon reasonings which experience confirms.

To obtain the solution of this problem, I mixed various quantities of ferment and sugar; I observed in every case what took place in each, and confirmed, by other observations, what had been produced by the first. Sixty grammes of ferment, not dried, and 300 grammes of sugar, very soon began to ferment at a temperature of 15 degrees; in the space of four or five days all the saccharine matter disappeared; 51,5 litres of carbonic acid were disengaged; the liquor being filtered and distilled to two-thirds, yielded, by a second rectification, 863 grammes of brandy of 13 degrees; the apparatus was so disposed as to lose nothing, the lobes being refrigerated with marine salt and ice. I found that this quantity of brandy was equal to 171,5 grammes of alkohol, at 39 degrees. The residues of the distillation of the alkoholic liquor were poured into a capsule, and evaporated to dryness; the second yielded nothing; the first furnished about 12 grammes of nauseous matter, somewhat acid, and attracting, in a slight degree, the humidity of the air. I wished to investigate the nature of this acid, but the quantity was too small: Lavoisier asserts that it is acetous acid. In another experiment, out of 60 grammes of ferment there remained 40 grammes of a substance which I thought more animalised than ferment itself. I I was much astonished, upon distilling it, to find that it yielded much less ammoniac. I then doubted whether fermentation would take place if I again mixed it with sugar; and if, by this method, all the azote would disappear. Accordingly, at the end of a week, having filtered the liquor, I obtained, for a residue, 30 grammes of a matter which, when distilled, afforded no trace of volatile alkali. I was pursuaded that azote would be disengaged

engaged with carbonic acid gas; to convince myself of it, I collected about 41 litres of carbonic acid in a bottle reversed, and filled with a solution of caustic potash. The whole was absorbed, which leaves no doubt respecting its purity. What then becomes of the azote? it must either exist in the residue of the ferment, or in the residue obtained by the evaporation of the alkoholic liquor, or in the alkohol; but the residue forms only half of the ferment employed; the quantity of matter proceeding from 300 grammes of sugar and 60 of ferment does not exceed 12 grammes; and neither of them yields ammoniac upon being distilled; while, on the other hand, ferment furnishes a great quantity. If these observations are correct, if I have accurately attended to all the phenomena, and have not been deceived, we must conclude that azote exists in alkohol; but I have in vain endeavoured to discover its presence in that liquid, in ether, and acetous acid; by making those bodies pass through ignited tubes, and burning the gas in Volta's eudiometer, by means of the electric spark, such a small quantity is obtained that it is not sufficient to decide the question; twenty-four or twenty-five parts of gas furnish at most but one of residue. I have, however, made several other experiments, which tend to prove that azote may exist in a substance, without being discoverable by distillation; that consequently it may be one of the component principles of vegetables, though they do not in general yield ammoniac upon distillation. But as I have not yet repeated these experiments, and as they are so important that too much caution cannot be used in announcing them, I purpose to revise and to vary them; I shall endeavour to appreciate all the circumstances, and, if I obtain convincing proofs, I shall not fail to communicate them to the class. These results, at least, afford us sufficient

ficient light to discover what passes in the act of fermentation; on this subject I cannot subscribe to Lavoisier's opinion. I do not think, like him, that all ready-formed carbonic acid proceeds from sugar. How, in this case, can the action of ferment upon itself be explained? I imagine that the first portions of acid are owing to a combination of carbon, ferment, and oxygen, with sugar, and that, by depriving the latter of a portion of this principle, the ferment excites fermentation. To elucidate this idea, I suppose a particle of sugar is composed of eight parts of oxygen, four parts of carbon, and one of hydrogen, which is not very remote from the truth, according to Lavoisier's experiments. One of these eight parts of oxygen seizes upon a fourth part of the carbon in the ferment, and thus the equilibrium between the principles of the sugar being destroyed, they combine, in a different manner, so as to form carbonic acid and alkohol. The ferment has, indeed, a great attraction for oxygen; this is proved, by its decomposing the air with the greatest facility; it is produced from carbonic and acetous acids, and the azote is set at liberty. If pure be used instead of common air, the reaction is still more speedy. I introduced 15 grammes of ferment into a bottle filled with pure air; I opened it in mercury; it had absorbed about one-fifth of its bulk; the ferment had turned sour; all the oxygen gas had imperceptibly disappeared, and was converted into carbonic acid: the temperature at which I operated was 15 degrees. From these statements we see what becomes of the carbon of the ferment; we shall see what takes place with the other principles by the account of the quantity of products resulting from a given quantity of matter put in fermentation, and by comparing the nature of the one with that of the other. From 60 grammes of ferment and 300 of

 sugar,

sugar, I obtained carbonic acid 95 grammes, pure alkohol 171,5 grammes, 12 grammes of extractive matter, a little acid, containing no azote; the residue of the ferment 40 grammes. These 40 grammes were found to contain 25 of ferment; so that only 35 had been employed for the decomposition of the sugar, and these 35 were reduced to 15 by a white substance *, insoluble in water, without action upon sugar, yielding no ammoniac by distillation, and leaving a charcoal which burns almost without residue; in short, exhibiting characters which distinguish it from every other, and which induce me to consider it as a distinct substance. Hence it appears, that the ferment takes away the oxygen from the sugar not only by means of part of its carbon, but likewise by a portion of its hydrogen; for the quantity of carbon which is given out by the ferment is too small to be alone the germ of fermentation; the azote disappears, and probably enters into the composition of the alkohol: the other principles of the ferment form acetous acid, and

* The ferment deposited by a juice in fermentation is seldom pure; in general it contains more or less of this white substance, which is sometimes so abundant that the deposit is almost entirely formed of it. It is of the mixture of these two matters that the dregs of different wines are, in a great measure, composed. All these effects depend upon the relative quantity of the ferment and the sugar: if there be much ferment and little sugar, the yeast will be pure; but, on the contrary, if there be much sugar and little ferment, the deposit will contain little yeast, or perhaps none at all: it will then be entirely composed of the white substance above mentioned, and the wine above will be, or may have been, saccharine. If ferment be only a produce of fermentation, it yet acts a distinguished part in this phenomenon; and if it be not the original cause of it, which is not certain, even in this case, at least it continues its production. This caused me to say above, that, in every point of view, nature presented us numerous applications of the theory which I am explaining.

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a particular insoluble white matter, which is precipitated. The acetous acid remains in solution in the alkoholic liquor with an extractive substance, which doubtless proceeds from the sugar, and is of a nature foreign from the acid. It is not probable that the elements of the latter, re-acting upon each other, when the equilibrium between them is dissolved, form water; there is very little hydrogen in sugar, but there is a great quantity in alkohol: besides, by adding the quantities of carbonic acid, alkohol, extractive matter, and the residue obtained, we find within $\frac{1}{11}$ the quantity of matter which produced them. This loss must be attributed to the water contained in the sugar, and is by no means owing to the alkohol carried away by the carbonic acid. Of this fact I convinced myself by introducing above 30 litres of this gas into caustic potash; by distillation and rectification I obtained only a few grammes of liquid, the alkoholic taste of which was so weak as scarcely to be perceptible *. This theory appears to me the more probable, as it perfectly accords with facts; and this truth becomes particularly striking upon comparing them. I am far, however, from considering it complete. It will doubtless receive in time that perfection which it still wants. I myself hope soon

* M. Seguin has presented to the Institute a very different theory of fermentation. He thinks that in this operation the water is decomposed, that its oxygen seizes the carbon of the ferment, and produces carbonic acid, while its hydrogen flies off to the sugar, and converts it into alkohol. In order to admit this theory, a greater quantity of alkohol than there is of sugar ought to be obtained, whereas not much above half its weight is produced: besides, supposing that all the carbon of the decomposed ferment passes over to the state of carbonic acid, only a sixth part at most would be formed from that which is disengaged, as may easily be ascertained from the preceding statements. Another argument against this theory is, that sugar contains a great quantity of oxygen, and alkohol very little.

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to add to its perspicuity. I know not whether I shall succeed in discovering what becomes of the azote of the ferment; but I shall not have much difficulty in determining, whether the residue, which is obtained, and which I consider as a substance, *sui generis*, be produced by fermentation as I believe; whether the sugar contributes to its formation, which is possible, or whether it exists ready formed, and is only deposited, which is contrary to all probability. I shall state the experiments that have removed all my doubts on this subject in a second memoir; in which I shall not only illustrate such points of this as may appear if not equivocal, at least not sufficiently grounded, but shall likewise collect all the details that form the sequel to it. Here, on the contrary, I have avoided them as much as possible, intending only to consider the phenomenon in a general manner.

Improved Method of preparing Mineral Kermes.

From Göttling's Pocket-Book for Chemists and Apothecaries for the Year 1803.

After deducing his principles of improvement from the elucidation of the nature and formation of mineral kermes, by Thenard, the author proposes the following method of preparation.

Reduce separately in powder, then mix together sixteen parts of crude antimony (sulphuretted antimony), twenty-four parts of purified potash (alkalinulated carbonate of potash), and three parts of flowers of sulphur (sublimated sulphur); put the mixture into a crucible, and reduce it to a state of complete fusion. When cold, pulverize

pulverize the mass, boil it half an hour with 128 parts of wáter, filtre the liquid while boiling through a fine cloth, let it run into a pan containing 156 parts of water, and leave it exposed to the action of the air in a shallow vessel, where it presents a considerable surface, from forty-eight to seventy-two hours, or till parts of a bright orange colour appear upon its surface.

Then decant the liquid, wash the matter deposited in a large quantity of water, remove it to a filter; after which it must be dried by a gentle heat.

This process furnishes twelve or fourteen parts of mineral kermes, of a reddish-brown colour; the whole of the antimony, excepting a small extraneous residue, dissolves, and is transformed into kermes; a very small quantity of the antimony remains in the liquor, under the form of yellow sulphur.

Memoir which obtained the Prize, proposed by the National Institute of France, on the Question, "To point out the Earthy Substances, and the Processes necessary for manufacturing Earthen-ware, capable of resisting sudden Transitions from Heat to Cold, and cheap enough for general Use." By M. FOURMY.

From the JOURNAL DES MINES.

WITHOUT doubt the Institute in making choice of this subject did not propose merely to obtain information concerning the compositions more or less proper for strictly fulfilling the conditions of its programme; it assuredly intended to produce a general improvement in the whole system of the manufacture of common earthenware throughout the territories of the republic.

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I should therefore conceive, that this end would be very imperfectly answered if I confined myself to a mere statement of the processes which afforded the results I am about to present. It is my intention to proceed a step farther, and to demonstrate that these processes may be employed not only in establishments formed on new principles, but even in those most devoted to the old methods of proceeding.

Object of the Question.

The fine earthen-ware, and even that of a middling sort, are not the kinds which we ought to be the most desirous to improve. The taste and wealth of the purchaser will not fail to stimulate the emulation of artists.

But our common earthen-ware is defective in many material points, the manufacture of it being consigned to the hands of men too enslaved to habit to give room to suppose that they will be anxious to make any improvements in which they have no personal interest. It is therefore the common earthen-ware that ought to occupy the attention of men of science, whose public character imposes upon them the honourable task of promoting the public welfare in whatever concerns the arts.

The question therefore relates to a kind of earthen-ware, for general use, within the reach of every class of people, that is, the cheapest possible. This question I shall endeavour to resolve not by a multitude of particular receipts, more or less depending on local or other circumstances, but by giving examples founded on general principles, and applicable, in every situation, with the greatest facility.

This question contains three essential conditions:

1. Resistance to sudden transitions from heat to cold.

2. Salubrity

2. Salubrity resulting from the absence of all pernicious oxyds.

3. Cheapness.

The greatest part of the earthen-ware made in the republic is sufficiently capable of resisting sudden transitions from heat to cold, and the price is extremely low, but it is covered with the oxyds of pernicious metals.

In many departments a stone-ware is made, the varnish of which contains no oxyds of pernicious metals, and which can be afforded at a very moderate price, but is not fit for resisting the alternatives of heat and cold.

France as yet possesses no kind combining the three conditions here prescribed. Before we proceed to the means of obtaining them altogether, let us turn our attention to those conditions, and likewise to several other particulars relating to the manufacture of earthen-ware.

Of the Resistance of sudden Transitions from Heat to Cold.

Few, however intelligent they may be in other respects, form a just idea of what occurs in the organisation of articles of baked earth, when they quickly pass from a very high to a very low temperature, and *vice versa.*

It is well known, that earthy substances are extremely bad conductors of caloric, so that it is absolutely combating against the nature of those substances to make of them utensils intended to transmit that fluid.

It would be too long here to enter into the detail of all the obstacles resulting from a kind of inconsistency, which can only be justified by motives foreign to the present question. I shall only insist on one important observation; that a multitude of difficulties, in the execution, are combined with those arising from the nature of the substances themselves, to render articles composed of baked

baked earth far inferior to those of metal, with regard to the resistance of sudden alterations of temperature. These difficulties, which are very great in *heating*, are very much augmented in the *cooling*.

It is obvious, that if earthy substances heat much more slowly than metals, they must likewise cool more slowly: hence it follows, that the excellence of articles of baked earth consists, not only in their capability of enduring every sudden change of temperature, but likewise of resisting that from heat to cold better than from cold to heat.

Of Salubrity.

The substances composing the body, or, to employ the technical terms, the paste or biscuit of common earthenware in general, contain nothing prejudicial to health. But this observation does not apply to the varnish with which these wares are covered. These always contain a greater or less quantity of lead, which the addition of oxyds of copper, or other metals, contributes to render still more dangerous.

Thus, with regard to salubrity, it is impossible to make any improvement in the paste or biscuit of common earthen-ware; an alteration of the varnish, or covering only, must be attempted.

Of Varnishes.

The paste of common wares, intended to withstand sudden alterations of temperature, is almost always of such a soft texture as to absorb liquids and greasy substances. To remedy the inconveniences resulting from this disposition, the paste or biscuit is covered with a varnish, which, by the closeness of its texture, prevents all humidity from penetrating.

Baking,

Baking, it is well known, is a principal portion of the expense in the manufacture of baked earths, less perhaps on account of the quantity of fuel consumed, than the risks by which it is attended.

When the heat is raised to a very high degree, the expense of fuel is doubtless increased, but in a proportion very easily estimated; on the contrary, the risks and the precautions necessary for avoiding them augment the price in a proportion almost beyond calculation. Hence arises the excessive difference in price between articles requiring a very high temperature and those for which a low degree of heat is sufficient.

The degree of temperature is almost always regulated by the fusibility of the varnish, which explains the reason why manufacturers confine themselves to such compositions, for varnish, as are most easily fused.

There are, however, limits which the most rigid economy cannot exceed, without altering the quality of the manufacture. At low temperatures only such compositions can be vitrified as contain an excess of lead or alkali; and this kind of vitrification is easily decomposed for no other reason but because it does not receive a sufficient degree of heat.

An elevated temperature would, without doubt, produce varnishes less defective than those in general obtained; but, in the present state of the manufacture, this would sacrifice the only advantage they possess, that is, the economy resulting from a low temperature. Besides, with whatever care these varnishes may be made, they are always extremely tender, and liable to chip off, consequently they do not long preserve their lustre.

It would therefore be advisable to abandon such compositions for others of a more solid nature, which by their salubrity and duration would amply compensate the

the increase in expense for baking, and for wholesome varnishes. These may be distinguished into natural and artificial.

Of natural Salubrious Varnishes.

The natural varnish is that polish acquired by certain kinds of earthen-ware in arriving at the state of *stone.* This effect of the vitrification of the surface, which is in some degree natural, is more or less promoted by the alkali and lime of ashes put in motion in the oven. In many manufactories it is accelerated by the vapour of muriate of soda introduced into the oven towards the conclusion of the baking.

These kinds of varnish are subject to many disadvantages which subtract greatly from their merit.

1. They are always imperfectly fused, as the workman is obliged to lower the temperature before they are completely melted. Being produced only by the commencing vitrification of the exterior surface of the biscuit, which precedes that of the interior portion only by a few degrees, it is conceived that, if the fire were continued till the vitrification of the surfaces is complete, the inside would be softened to such a degree that the wares would drop to pieces.

2. They are unequally spread, being produced by a cause which does not act with regularity, that is by the operation of the flame, and the vitrifying substances which it carries along, and deposits on its passage. That fluid is not equally powerful in every part of the oven. Its passage is more or less aided by the intervals left between the different articles, and these intervals themselves are irregular, being great between large articles, small between those of smaller dimensions; besides which, the course of the flame through the oven causes

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its effects to be more powerful on one side than on the other.

Thus, on all wares covered with natural varnishes, there are inequalities which are insufferable, excepting on very coarse articles.

3. Lastly, these varnishes can scarcely be formed but on wares incapable of withstanding the sudden alternatives of heat and cold.

It is obvious, that the exterior of an earthy composition cannot be subjected to a degree of heat sufficient to obtain of itself a complete varnish, but the interior must at the same time acquire a degree of vitrification that prevents the necessary expansion and contraction required by the alternatives to which vessels intended to bear fire are exposed.

We cannot therefore recur to natural varnishes, if we wish that the articles should preserve the texture which is necessary for them: to endure sudden transitions from heat to cold we must employ artificial varnishes.

Of artificial Salubrious Varnishes.

I have already said, that salubrity is not absolutely incompatible with compositions of which lead forms a part, if they were submitted to a degree of heat sufficient to vitrify them completely. But the expense of the lead, added to that caused by the increased consumption of fuel, would make these compositions far too dear for common wares. The same reason of economy forbids the use of saline compositions.

The only compositions by which these objections can be obviated, are such as are purely earthy. These must obtain the preference, not only because they are least expensive, but because they are capable of bearing the friction of hard bodies.

It is easy to see that the purely earthy covering of real hard porcelain * is much more difficult to chip off than that of wares into the varnish of which lead and salts are admitted, such as the soft porcelain, most of the middling kinds †, and all our common wares.

Besides their salubrity and cheapness, earthy varnishes possess, in point of political economy, a very great advantage over saline or metallic varnishes. If not the whole, at least a great portion of the lead, tin, copper, soda, potash, &c. which constitute part of the latter, are imported from abroad; on the contrary, we find at home, and in very great abundance, the earthy substances proper for the composition of the former.

These, then, deserve the preference, not only because they are harder, and contain nothing pernicious to the health of man, but likewise because they require no substance procured from foreign countries, prepared by other hands, or of the smallest value, before the manufacturer determines to turn it to advantage.

Nature furnishes a great number of earthy mixtures proper for making varnishes more or less capable of enduring heat. These abound in France to such a degree, that it would be much easier to enumerate those places which are destitute of them than those which contain them. But as they are not always found in the state required, it is almost indispensably necessary that they should be composed at the discretion of the manufacturer. On this head no determinate rules can be given; the

* There are certain manufacturers of porcelain called *hard*, who employ saline or metallic fluxes to soften their composition, but it is not to these that I allude.

† I say most, because this is not the case with all; there are some, the enamel of which is extremely hard, because it contains a great quantity of silica and oxyd of tin.

composition

composition and application of which must depend entirely upon circumstances.

No varnish can be attached to any paste or biscuit whatever, excepting by means of their respective affinities, which are more or less developed by the temperature to which they are exposed. The component parts of one must therefore vary, not only in proportion to the component parts of the other, but likewise in proportion to the temperature by which their combination is to be effected.

If, therefore, we include, in the number of these variations, 1, that of the respective principles; 2, that of every possible combination; 3, that of all the temperatures by which they may be modified; we shall then see that they must be incalculable.

For this reason, instead of prescribing formulæ, the application of which would be rendered perfectly accidental by these variations, I shall mention a few examples of varnishes already in use; and a comparison of these, with such as I shall propose, will be a sufficient guide to every artist, let him be ever so little conversant with the manufacture. When he is acquainted with the component parts of the biscuit to be covered, and at what temperature that biscuit acquires it properties, he will not be long at a loss for the varnish that he ought to apply.

TO BE CONCLUDED IN OUR NEXT.

Intelligence relating to Arts, Manufactures, &c.

(Authentic Communications for this Department of our Work will be thankfully received.)

Action for Damages for taking an undue Advantage of the Communication of an Invention, and obtaining the King's Patent, to the Prejudice of the Inventor.

Common Pleas, Westminster-Hall, Dec. 6, 1803, before Lord ALVANLEY *and a Special Jury.*

SMITH *v.* DICKINSON.

THIS action was brought by the plaintiff, a sadler, in Bond-street, against defendant, (the proprietor of Gowland's lotion), to recover damages for the injury he had sustained by the defendant's availing himself of a communication which plaintiff had made to him, of an invention for which plaintiff was about to take out a patent.

It appeared from the statement of Mr. Serjeant Best, counsel for the plaintiff, that some years ago the plaintiff had obtained a patent for an apparatus to give play or elasticity to the girths of saddles; and that defendant had, so late as November, 1801 *, obtained a patent for an apparatus to answer the same purpose, but having heard of the plaintiff's invention, he called on him, in order to see how far the two inventions resembled each other. They were found to be the same in principle, but different in the mode of applying them. The plaintiff then informed the defendant that he had an invention far superior to either of them, and for which he intended to take out a

* Published in the sixteenth volume of the first series of this work, p. 294.

patent;

patent; for that he found the former plan did not succeed in *retaining* the elasticity. The defendant much wished to see the plan, but the plaintiff then refused to let him. On the 12th January, 1802, the defendant signed a memorandum, admitting that the plaintiff had contrived various articles in the way of his business, which he conceived to be new and valuable improvements. And that defendant was desirous of being made acquainted with one of them, which he fully comprehended, under the title of Spring Apparatus, to produce the same effect as that for which defendant had obtained a patent, he, defendant, by such memorandum, pledged himself not to take advantage of such communication, "under the penalty of breach of honour, and 1,000 *l*." Whereupon plaintiff shewed defendant a rude sketch of the invention, which he could not comprehend until the plaintiff explained it to him by means of a common snap mouse-trap, which he had provided for the purpose. The defendant was satisfied with the simplicity and usefulness of the invention, and assured plaintiff that the agreement for their being jointly concerned in the patent should be carried into effect, &c. Minutes of which had been before taken by Mr. William Nicholson, of Soho-square, in order to enable him to give instructions to defendant's solicitor to prepare a proper instrument between them. After some time, plaintiff was informed the defendant had actually taken out a patent himself. An explanation was required; and plaintiff was so far convinced of the defendant's solemn assurances, that the proposed agreement should be carried into effect, that he was induced to attend at Mr. Nicholson's, in order to give instructions respecting the specification. It was then perfectly understood, that the parties were to be jointly concerned in the business, though the patent had been obtained

tained by defendant solely, without the plaintiff's consent. The patent being complete, some months passed, but defendant would not come forward to enter into the agreement; plaintiff was therefore alarmed; and after making several applications to defendant, he at last received a letter, dated May 29, 1802, to the effect following. "Sir, I am unconscious of any contract at present "between us, nor can Mr. Nicholson or Mr. Foulkes "help me to the recollection of any, although you refer "me to them for that purpose. The two inventions* "for which I have obtained patents are my own inven- "tions. Prior to my giving you a paper not to prac- "tise any invention you might communicate, *I had de- "posited a drawing in the hands of a friend* †, *and had a "workman actually employed in making the article for which "my last patent is obtained. And this drawing was deposited "for the purpose of proving, should it be necessary, what my "design and invention consisted of prior to any communica- "tion from you, least even, if it should be the same, I might "still go on to obtain my patent.* How far your inven- "tion resembled mine is of no consequence; I went on "with my own. Your communication had in it nothing "new, therefore I do not consider myself as using your "invention, but my own. One of the things you "shewed me from your drawer is a very clever in- "vention ‡, and which in my new business § I should

* Alluding to his of November, 1801, and the late one of plaintiff's.

† The circumstances attending the deposit of this drawing will most probably appear in our statement of this case at the future hearing, some of the facts having come out since the present trial.

‡ Alluding to new inventions, for which Smith proposes to take out a patent, as we are informed.

§ Dickinson actually opened a sadler's shop, but sold every thing off just before the trial.

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"like to use; but although it is in my power I will not "use it. I hope, therefore, you will take out your pa- "tent, and secure it to yourself in time. It is almost "too tempting, to be in the possession of the knowledge "of a thing so useful, as well as flattering to a man's va- "nity as the invention, and not to make use of it. If "you will bring it out, you shall have all the further as- "sistance necessary, and which I can give; but if you "will not, I should almost think it right to publish it "myself, as it is doing no good where it is. If you will "not bring it out, say upon what terms I shall do it, as "I think it almost indispensable. I shall be at home till "eleven this morning, if you think it worth your while "to call. I am, &c."

As defendant by this letter denied all knowledge of the Agreement, and asserted that he was the inventor, the plaintiff commenced this action.

It was proved on the trial, that the plaintiff was the inventor of the apparatus; and Mr. Nicholson stated that from what passed in his presence between the plaintiff and defendant, he understood they were to be jointly concerned in the patent; and that the invention was the plaintiff's, from whose instructions and plan Mr. Nicholson prepared the specification *.

Several reputable witnesses were also called, to prove the novelty and utility of the invention; who shewed that an elasticity of no less than five inches was given to the girths by the action of the springs, and created an ease and freedom of respiration to the horse that has in vain been long desired; and that by its adoption horses will not be liable to be hurt or galled by the rubbing of the saddle, as they frequently are by the girths not being

* Published in the first volume of the second series of this work, p. 247.

right, which they will endeavour to prevent by blowing themselves out, in order to enjoy greater power of respiration.

The defendant's counsel, Mr. Serjeant Shepherd, contended that the plaintiff, by attending the making out the specification, had consented to the patent being taken out in the defendant's name; and that therefore the defendant had not taken an undue advantage of the communication; and stated some legal objections in support of his argument. He also attempted to shew that the invention was not of any value, and offered to give the patent to the plaintiff, if he chose to take it; but he called no witnesses.

Lord Alvanley said he was glad the case had assumed a different aspect from what he expected; for it would have been impossible to have believed that the defendant was the inventor if he had not twenty witnesses to swear he was so, after the facts that had transpired. But the question of fact was altered to a question of law, which he always wished to have decided by the full court rather than by a judge sitting at *Nisi Prius*. That the plaintiff had been grossly ill used was evident, and was entitled to some compensation, for there could be no doubt if any advantage had been taken an action would lie. The question therefore was, whether the defendant had taken the advantage laid in the declaration? (which he read.) And after recapitulating the evidence, he left it to the jury to consider,

1st. Whether the invention in the sketch is the same as in the patent?

2d. Whether, at the time of taking out the patent in defendant's name, the defendant had the plaintiff's assent to take it out so?

3d. As to the subsequent consent.

4th.

4th. As to the damages actually sustained by the plaintiff, the defendant having undertaken to assign the patent to plaintiff at his own expense?

The jury retired about half an hour, and returned a verdict for the plaintiff 300*l.* damages, and 40*s.* costs.

That the plaintiff shall have an assignment of the patent made to him, his executors, administrators, and assigns, for the remainder of the term therein to come and unexpired; and that such assignment be made at the expense of the defendant, which the defendant, by his counsel, consented, and undertook forthwith to do.

And the jury found the facts following.

That the invention of the plaintiff is the same as is contained in the specification of the patent obtained by the defendant; and

That the plaintiff, by assisting at the meeting in Soho-square, and in making out the said specification, virtually agreed that the patent should be in the defendant's name.

The plaintiff is also to be at liberty to move the Court of Common Pleas, that a verdict for 1000*l.* may be entered for the plaintiff if the court shall be of opinion, that the 1000*l.* mentioned in the agreement, bearing date the 12th of January, 1802, is in the nature of liquidated damages, and not in the nature of a penalty. And if the court shall be of opinion, that the defendant has not taken an undue advantage of the plaintiff, then a nonsuit to be entered *.

* As this matter is intended to be argued before the Judges of the Court of Common Pleas next term, we shall endeavour to procure, and lay before our readers, an accurate report of the fate of the verdict upon such special argument.

Infringement of a Patent.

King's Bench, Guildhall, Dec. 23, 1803, before Lord ELLENBOROUGH *and a Special Jury.*

HUDDART *v.* GRIMSHAW.

This was an action brought by the plaintiff for infringement on his patent for "a new mode or art of making great cables and other cordage, so as to attain a greater degree of strength therein, by a more equal distribution of the strain upon the yarns *."

The plaintiff obtained his patent in 1793. The defendant Mr. Grimshaw visited him in 1799. On this occasion he requested the plaintiff to permit him and his partner to adopt his method of rope-making at their great ropery in Sunderland, to which Captain Huddart replied that he had no objection, provided the gentlemen with whom he was concerned would give their consent. A letter was soon afterwards sent to the plaintiff by the defendant's partner, returning thanks for the plaintiff's civility, and renewing the request that he would permit them to *adopt his method of rope-making at their ropery only, without premium.* To this letter the plaintiff, after consulting his partners, returned an answer, containing a positive refusal.

From that time it was proved, that the defendant carried on his manufacture in a private manner, shutting up his work-place, and suffering none to enter it excepting persons in whom he could confide; and, as it was alledged, practising part of the plaintiff's invention.

In support of the plaintiff's case, several witnesses were examined.

Mr. Gibbs, for the defendant, asserted, that this action was brought as a bill of discovery, in order to find out

* See the specification in the present number, page 81.

out by what means the defendant was enabled to manufacture ropes, equal in quality to the plaintiff's, and bring them to market at a cheaper rate. If he could only make this discovery, the plaintiff was unconcerned about the fate of the present action. He would, however, be disappointed, continued the learned counsel, for his client would not let him into his secret. There was no proof, he contended, that the defendant had infringed on the plaintiff's patent, and that the former was not obliged to discover how and in what manner he was enabled to make as good cordage as the plaintiff. He then argued that the plaintiff had, in his specification, described certain parts of the machinery as his own invention, though they had actually been before invented by a Mr. Balfour, who had obtained a patent for the same *. The defendant's patent could not therefore be valid. In point of law, a person must take out a patent neither wider nor narrower than his invention; the specification must be sufficient to enable a workman of skill to perform the thing described. And he contended that the plaintiff could not maintain his patent because it is wider.

The defendant called no witnesses.

Lord Ellenborough, after stating the principal points of the law relative to the case, recapitulated the evidence, and observed that there was certainly *prima facie* evidence that the defendant had made use of part of the plaintiff's invention; but he left it to the jury to consider whether or not it was an infringement of the plaintiff's patent.

The jury, without retiring, returned a verdict for the plaintiff.

* See the specification in the second volume of the first series of this work, page 145.

Smithfield

Smithfield Club.

The annual exhibition of prize cattle took place on Friday, December 16, in Wootton's Yard, Smithfield, and the next day the club met at the Crown and Anchor Tavern. There was a numerous and respectable attendance; the Duke of Bedford was in the chair. After dinner the chairman rose to state to the company the manner in which the prizes for the last year had been adjudged.

Mr. Gray (of Tracey Park, near Bath) mentioned to the company a remedy for the disease of scouring in cattle, which had been found to be of the most efficacious kind. Several of his cattle had been attacked with this disease, and he had applied various remedies: all of them had, however, proved ineffectual, till he had made trial of Mr. Bellamy's Bath Powder, the effect of which had been so direct and immediate, that he felt it his duty to recommend it to the attention of the public.

Lord Somerville corroborated this opinion of the efficacy of Mr. Bellamy's powder for the cure of the above disease in cattle. He thought it deserved the serious attention and support of all those of whom the Society was composed.

New Thermometer.

M. De la Lande has presented to the Institute a new thermometer, the degrees of which appear to the author more conformable to philosophical principles, and more convenient, than those of Reaumur. He places Zero at the temperature of $9\frac{1}{2}$, and 31 instead of 26. He remarks, that the numbers 30 and 40 are those of the degrees of heat in summer and cold in winter, 30 for moderate summers and mild winters; 40 for hot summers and intense winters. Mossy, the most celebrated maker of thermometers at Paris, known for the accuracy of his works, has already begun to execute the new thermometers.

Society for improving the Condition of Chimney Sweepers.

The following persons have undertaken to sweep chimneys by mechanical means, in pursuance of the plan prescribed by the Committee of the Society for superseding the necessity of climbing boys, by encouraging a new method of sweeping chimneys, and for improving the condition of children and others employed by chimney-sweepers.

Richard Page, chimney-sweeper, No. 23, Colonnade, near Guildford-street, Foundling-Hospital.

Thomas Wood, No. 36, Poland-street, Oxford-road.

Thomas Taylor, No. 9, Wells-street, Oxford-road.

George Smart, No. 15, Great Bell-alley, Coleman-street, at his timber-yard, Pratt's-place, Camden Town, and at Ordnance-wharf, Westminster-bridge.

George Turner and James Laver, Walthamstow.

Bath and West of England Society for the Encouragement of Arts, Manufactures, and Commerce.

The annual meeting of this Society was held at Bath, December 13, 1803. Many lots of neat cattle, sheep, and pigs, both fat and for breed, having been exhibited in the usual manner for the premiums, committees of inspection were appointed to report on the respective merits; competent committees were also chosen, for the purpose of ascertaining the merits of the several agricultural implements, &c. produced by the Society, as well as for the inspection of cloth and wool.

At this meeting, premiums to the amount of 209 *l.* 2 *s.* 6 *d.* were adjudged.

The Bedfordean gold medal will be presented to the author, who, at or before the first meeting in November, 1804, shall produce to the Society the best essay, founded on practical experience, on the nature and properties

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of manures, and the mode of preparing and applying them to the various soils; in which essay shall be pointed out the best and cheapest manner of collecting and preparing the different kinds of manures, and of the state, season, and quantity, in which they should be applied.

List of Patents for Inventions, &c.

(Continued from Page 89.)

BOOTH HODGETTS, of Dudley, in the county of Worcester, Nail Ironmonger; for machinery for rolling iron for shanks, and for forming the same into shanks for nails. Dated November 8, 1803.

RICHARD YOUNGER, of Pittm[illegible]-buildings, Old-street, in the county of Middlesex, Gentleman; for an improved method of extracting worts from malt, barley, and other grains and substances. Dated November 12, 1803.

WILLIAM FREEMANTLE, of Bunhill-row, in the parish of St. Luke, Old-street, in the county of Middlesex, Watchmaker; for improvements in the construction of steam-engines. Dated November 17, 1803.

JAMES BEVANS, of Castle-street, City-road, in the county of Middlesex, Carpenter, being one of the society of the people called Quakers; for methods of applying machinery for the purposes of more expeditiously striking, or sticking mouldings, and for rabbetting, ploughing or grooving, fluting, and excavating, wood, in every manner, now usually performed by any kind of plane. Dated November 19, 1803.

GEORGE PENTON, of New-street-square, in the city of London, Brass-founder; for an improvement on lamps, commonly called Argand's lamps.
Dated November 19, 1803.